Petition to De-List

The Lower San Joaquin River

As A Water Body Impaired By

Salt and Boron

Under §303(d) of the California Clean Water Act

Submitted By:

San Joaquin River Group Authority

I. INTRODUCTION

Due to frequent exceedances of water quality objectives for salinity at Vernalis, the Central Valley Regional Water Quality Control Board ("Regional Board") included the Lower San Joaquin River[1] ("LSJR") as an impaired water body on the California Clean Water Act §303(d) list.[2] (Total Maximum Daily Load ("TMDL") for Salinity and Boron in the Lower San Joaquin River, Staff Report of the California Environmental Protection Agency, Regional Water Quality Control Board, Central Valley Region, January 2002 ("2002 TMDL Report"), p1.)

Salinity objectives for the Lower San Joaquin River ("LSJR"), measured as electrical conductivity ("EC"), contained in the current Southern Delta EC Objectives in the Water Quality Objectives for Agricultural Beneficial Uses, are designed to protect South Delta agriculture. (1995 Water Quality Control Plan for the San Francisco Bar/Sacramento-San Joaquin Delta Estuary ("1995 WQCP"), p 17, Table 2.) The Southern Delta EC Objective is measured at Vernalis ("Vernalis Objectives") and requires an EC of 0.7 decisiemens per meter ("dS/m") from April 1 through August 31 ("Vernalis Irrigation Season Objective") and 1.0 dS/m at all other times ("Vernalis Non-Irrigation Season Objective"), based on a running 30-day average. In addition, the Regional Board has adopted boron water quality objectives for the LSJR, but these objectives were never approved by the United States Environmental Protection Agency.

[1] For basin planning purposes, the LSJR is the region draining the 130 miles of the San Joaquin River downstream of Mendota Dam and upstream of Vernalis. (Final Staff Report of the California Environmental Protection Agency Regional Water Quality Control Board Central Valley Region, September 10, 2004 ("Final Staff Report"), p5.)

[2] An "exceedance" occurs when the concentration of the controlled pollutant is greater than the amount allowed by the water quality objective. In the case of salinity, an exceedance would occur any time the EC is more than 0.7 dS/m from April 1 through August 31 and 1.0 dS/m from September 1 through March 31. A "violation" would only occur if the running 30-day average were greater than 0.7 dS/m from April 1 through August 31 and 1.0 dS/m from September 1 through March 31.

(2002 TMDL Report, p2.) Water quality objectives for boron will be reviewed as part of the ongoing Basin Plan Amendment process to establish new salinity objectives. (Id.)

Table 1: Applicable Water Quality Objectives

SALINITY Reach	Irrigation Season (April 1 – August 31)	Non-Irrigation Season (September 1 – March 1)
Vernalis only	0.7 dS/m (30-day running average)	1.0 dS/m (30-day running average)
BORON Reach	Irrigation Season (March 15 – September 15)	Non-Irrigation Season (September 16 – March 14)
Sack Dam to Merced River	2.0 mg/L (maximum) 0.8 mg/L (monthly mean)	5.8 mg/L (maximum) 2.0 mg/L (monthly mean)
Merced River to Vernalis	2.0 mg/L (maximum) 0.8 mg/L (monthly mean)	2.6 mg/L (maximum) 1.0 mg/L (monthly mean)[3]

The Regional Board has prepared TMDL's for salt and boron for the LSJR.[4] The Basin Plan amendment for the salt and boron TMDL is currently before the SWRCB.

The San Joaquin River Group Authority ("SJRGA") petitions the State Water Resources Control Board ("SWRCB") to de-list the LSJR as a water body impaired by salt and boron. (Water Code §13191.3.) The SJRGA requests the de-listing, because the Vernalis Salinity Objectives are being met, beneficial uses are not impaired, and the Vernalis Salinity Objectives will continue to be met in the future.

II. De-Listing Requirements.

Pursuant to §13191.3(a) of the Water Code, the SWRCB prepared guidelines for the listing and de-listing of water bodies and the development and implementation of TMDL's pursuant to §303(d) of the Federal Clean Water Act.[5] Under the Listing Policy,

[3] In Critical years, the required monthly mean Non-Irrigation Season Merced River-Vernalis Boron Objective is 1.3 mg/L.

[4] A TMDL, usually expressed as mass per time, is the sum of the receiving water's loading capacity allocated to an existing or future point source, the portion of the receiving water's Loading Capacity allocated to an existing or future non-point source of pollution or to natural background sources, and an appropriate margin of safety. (Final Staff Report, p30; 2002 TMDL Report, p5-6.) The Loading Capacity is the most loading the water body can receive without violating water quality standards. (Id.)

[5] According to Water Code §13191.3(a),

a water body shall be de-listed if water quality objectives are being met, beneficial uses are not impaired, and water quality objectives will be met in the future. (Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List ("Listing Policy"), p11; Final Staff Report on Changes to California's Clean Water Act Section 303(d) List (December 14, 2001) p17.) A water body shall also be de-listed if the water quality objective is revised and conditions in the water body would comply with the revised water quality objective. (Id.) Based on all of the foregoing reasons, the Regional Board must de-list the LSJR for impairment due to salt and boron.

III. There Have Been No Violations of the Vernalis Objectives Since 1995.

The SWRCB Listing Policy requires that a water body listed as impaired due to exceeded water quality objectives, criteria, or standards for conventional pollutants be de-listed if the number of measured exceedances are less than or equal to about 25%. (Listing Policy, p15, Table 4.2.) The de-listing analysis must be based on at least 30 samples. (Id.)

The Regional Board listed the LSJR as an impaired water body due to frequent exceedances during the twelve-year period from 1986 to 1998. Half of these years however, consisted of one of the most serious, prolonged droughts in California history, skewing the data and biasing the sample.

Since 1995, there have been no violations of the Vernalis Objectives. (See Exhibit A, Declaration of Dan Steiner with attached EC data.) The Vernalis Objectives are based on a 30-day running average, which over nine years, constitutes over 108 samples. (2002

The state board, on or before July 1, 2003, shall prepare guidelines to be used by the state board and the regional boards for the purpose of listing and delisting waters and developing and implementing the total maximum daily load (TMDL) program and total maximum daily loads pursuant to Section 303(d) of the federal Clean Water Act. (44 U.S.C Sec 1313(d).)

TMDL Report, p21.) Since there have been zero violations, the LSJR must be de-listed for EC.

IV. Beneficial Uses Are Not Impaired by EC at Vernalis.

The Regional Board concluded that, due to frequent exceedances of the Vernalis Objectives from 1986 to 1998, the LSJR could not fully support the beneficial uses of irrigation and agriculture. (Final Staff Report, p4.) However, no empirical or other data supporting such theoretical impacts has ever been presented. If there was such a causal link, then it would have occurred from 1987 to 1994, during the worst extended drought on record. While impacts on farms have been claimed, no evidence supporting such a claim has ever been submitted. Regional Board 303(d) documents are devoid of any analysis determining whether the beneficial use of irrigation and agriculture is actually impaired. Furthermore, farmers "believe" they are impacted when the Vernalis Objectives are exceeded, but empirical data shows no impact to South Delta agriculture due to salinity.

A. South Delta Farmers Have Never Established a Relationship Between Their Yields and Vernalis Water Quality.

The Vernalis Objectives were specifically intended to establish a maximum concentration of salinity in the water at Vernalis sufficient to support a 100% crop yield. (D-1641, p79.) Since then, it became conventional wisdom that any time the Vernalis Objectives were exceeded, especially the when the Vernalis Irrigation Season Salinity Objective applied, crop yields were affected. A farmer in the south Delta, William Salmon, testified that "**<u>Any</u>** actions which will increase salinity flowing into the South Delta will simply incrementally increase the harm which [my] farming operation is subjected to each year." (See Exhibit B, p47-48.) (emphasis added.)

While the foregoing statement by Mr. Salmon attempts to link the quality of water at Vernalis with the quality and yield of crops that he grows, the allegedly supporting information he submitted shows no correlation between his crops and water quality at Vernalis. In another declaration, Mr. Salmon stated that the salinity problem has been getting worse since 1999. (Bay-Delta, Depo. Tr. William Salmon, p13 (May 25, 1999).) If true, this is certainly odd, as there have been no violations of the Vernalis standard since at least 1995. (Exhibit A, Decl. of Dan Steiner and Vernalis EC data.) Indeed, Mr. Salmon testified in his deposition that he did not know if the Vernalis water quality standard had been violated since 2000. (Id., p15.) Thus, regardless of the veracity of Mr. Salmon's claims of salinity damage to his crops, he provided no data supporting a direct relationship between damage to his crops caused by salinity of the San Joaquin River water and violations of the Vernalis Objectives.[6]

Another farmer, Kurt Sharp, testified similarly, stating that "As salinity at Vernalis rises, particularly above the Vernalis standard, there is a corresponding negative effect on the irrigated crops grown by [me]." (Central Delta Water Agency ("CDWA") v. USA, declaration of Kurt Sharp, p3 (June 14, 1999).) (emphasis added.)[7] Mr. Sharp's statement has even less evidentiary support. Despite alleging a direct connection between

[6] Mr. Salmon's claim that salinity is the cause of the yield loss of his crops is dubious at best. In a 1999 deposition, Mr. Salmon admitted that he was unable to correlate damage to his walnuts to salinity of the irrigation water he used. He stated "Now, that is not totally. it is not totally. I can't totally say that it is the salt. I also have a virus, what they call black line disease which walnuts get." (Bay-Delta, Depo. Tr. William Salmon, p78 (May 25, 1999).) Mr. Salmon made a similar admission regarding tomatoes, for which he stated "And in 1990 I finally gave up growing tomatoes because I was no longer – it was no longer economically feasible for me to grow with my yields. My yields kept coming down. Now, I can't sit here and tell you that it was directly related to the salt in the water…" (Id., p81.) Perhaps most telling, despite this dramatic statement about quitting tomatoes due to declining yields, in 1999 Mr. Salmon planted 357.5 acres of tomatoes. (Id., Ex. 5.)

[7] The property Mr. Sharp farms is not located within the south Delta, but in the Central Delta Water Agency ("CDWA"), far to the north of the area to be protected by the Southern Delta water quality objectives. However, his testimony underscores the fact that many Delta farmers, even those who are not in the south Delta, believe south Delta salinity has adversely affected their crop yields.

water quality at Vernalis and adverse impacts to crops grown by R.C. Farms, Mr. Sharp admitted he has absolutely no basis for attempting to make such a connection. In a 2003 deposition, Mr. Sharp acknowledged that knowing the salt content of the irrigation water he was applying would be a key piece of information regarding his claim of connection between water quality at Vernalis and adverse impacts to crops he grows. (CDWA v. USA Depo. Tr. Kurt Sharp, June 24, 2003, p10-11.) Despite this, Mr. Sharp admitted that he did not know or check the salt content of the water he was applying, and acknowledged that water quality could be getting better and he would not even know it. (Id., p11, 21-22.)

Mr. Sharp was even more open and honest about lacking any information correlating water quality at Vernalis and impacts to the crops grown at R.C. Farms in his deposition taken June 24, 2003, as the following exchange illustrates:

> "Q. Have you done any analysis to understand the correlation between EC at Vernalis and EC at R.C. Farms?"
>
> "A. Have I done any what?"
>
> "Q. Analysis."
>
> "A. No."
>
> "Q. Are you aware of any reports or studies that you have read or reviewed that has a correlation between EC's at Vernalis and EC's at where you divert from the San Joaquin River?"
>
> "A. Say that question again."
>
> "Q. Yeah. Have you read any books, analysis, reports that shows a correlation between EC's at Vernalis and EC's at R.C. Farms?"
>
> "A. No, I have not." (CDWA v. USA, Depo. Tr., Kurt Sharp, p25 (June 24, 2003).)

When asked to give specific details about crop yield declines due to salt, Mr. Sharp testified that certain parts of R.C. farms' fields have been experiencing declines from 1997 up and through 2003 which he attributed to salt build-up (In re Long-Term Petition Change of: Modesto Irrigation District, et al., Depo. Tr. Kurt Sharp, p15-17 (March 27, 2003).)

A third farmer, Alex Hildebrand has testified that "Any time the Vernalis standard is exceeded, there is a corresponding negative effect on the irrigated crops grown in the South Delta. I have personally experienced such harm on my crops." (CDWA v. USA, Decl. of Hildebrand, p12-13 (May 7, 1999).) He too failed to provide any quantitative data supporting a link between violations of the Vernalis Objectives and his crop yields.

The Regional Board, in listing the LSJR as impaired due to EC, also concluded that the beneficial use of agriculture was impaired, but like the South Delta farmers, did so without any analysis, quantitative data, or citations to any supporting evidence. (2002 TMDL Report, p10.) The Regional Board, Messrs. Salmon, Sharp, and Hildebrand, and many others have consistently claimed that violations of the Vernalis Objectives have harmed their crop yields, but neither they, nor anyone else, have ever provided any quantitative evidence supporting a correlative or causal relationship between EC at EC at Vernalis and declining crop yields in the south Delta.

B. Historical Data Shows EC at Vernalis Has Not Impaired Beneficial Uses.

Due to the lack of competent analysis and objective, correlative data supporting the unsubstantiated belief that every time violations of the Vernalis Objectives occurs farmers in the Southern Delta experience a corresponding negative impact on their crops, the SJRGA conducted its own investigation to determine whether such a relationship existed. The SJRGA obtained data from the San Joaquin County Agriculture Commissioner's Reports and compared the data to historical water quality at Vernalis for every year from 1970 to 2003. (See Exhibit C: Compiled Crop Data, Tables 2-6.) The results indicate no relationship exists between Vernalis water quality and south Delta crop yields.

The Vernalis Objectives were established to protect agriculture, the most sensitive beneficial use. (2002 TMDL Report, p24.) In D-1485, the SWRCB adopted a Vernalis Irrigation Season Salinity Objective of 0.7 dS/m, the maximum average EC beans can tolerate in their root zone before declining in yield. (1995 WQCP, p5; See Exhibit D, p4.) Since beans were the most salt-sensitive crop grown in the South Delta, the SWRCB reasoned that establishing a salinity objective sufficient to protect beans would protect all other crops grown in the South Delta. (Id.) If Messrs. Salmon, Sharp, and Hildebrand were correct in their belief that their crop yields declined in direct relation to violations of the Vernalis Irrigation Season Salinity Objective, then violations of the Vernalis Objectives would impact beans more than any other crop.

The SJRGA directly compared bean yields to the corresponding average EC of each irrigation season in order to observe when yield declines corresponded with high salinity and when they did not correspond with high salinity.[8] (See Table 1.) An "irrigation season" was defined as the period each year from April 1 through August 31.

Table 2: Dry Bean Yield and Seasonal Average Water Quality at Vernalis, 1970-2003.[9]

Year	Yield (Tons/Acre)	EC (dS/m)	Year Type[10]
1970	0.88	0.68	AN
1971	0.88	0.72	BN
1972	1.05	1.01	D
1973	1.16	0.68	AN
1974	1.18	0.53	W
1975	1.18	0.57	W
1976	0.91	0.99	C
1977	0.89	1.49	C
1978	0.85	0.41	W
1979	0.97	0.68	AN
1980	1.07	0.71	W
1981	1.04	0.73	D
1982	0.80	0.28	W
1983	0.85	0.19	W
1984	0.91	0.63	AN
1985	1.15	0.62	D
1986	1.05	0.38	W
1987	1.06	0.72	C
1988	1.07	0.74	C
1989	1.04	0.75	C
1990	1.50	0.75	C
1991	1.15	0.86	C
1992	1.09	0.78	C
1993	1.13	0.64	W
1994	1.20	0.74	C
1995	1.15	0.26	W
1996	1.08	0.49	W
1997	1.14	0.56	W
1998	0.8	0.19	W
1999	1.15	0.45	AN
2000	1.09	0.46	AN
2001	1.05	0.58	D
2002	1.08	0.56	D
2003	1.09	0.55	BN

[8] Data for historical flow and electrical conductivity was obtained from Mr. Daniel Steiner. (Exhibit A.)
[9] Consecutive years in which the seasonal average exceeded the Objective are shaded yellow. Years in which the yield was less than 10% below the mean are shaded green.
[10] San Joaquin River Basin Index Year Types. W= Wet, AN = Above Normal, BN = Below Normal, D = Dry, C = Critical. (Exhibit E, p32.)

Overall, seasonal average EC at Vernalis ranged from a low of 0.19 dS/m to a high of 1.49 dS/m. The mean EC for the period was 0.63 dS/m.[11] Yields for that period ranged from a low of 0.80 tons/acre to a high of 1.5 tons/acre. The mean yield was 1.05 tons/acre.[12] However, since yields vary by about 10%, solely due to variations in weather, seed quality, insect infestations, fertilization, and other factors and farming practices, yields could have been as low as 0.90 tons/acre for reasons unrelated to water quality. (See Exhibit F, p2.)

In the thirty-three years observed, the seasonal average EC exceeded the Vernalis Irrigation Season Salinity Objective thirteen times. However, yields declined to less than 10% below the mean yield only twice – once in 1971, a Below Normal year, when yields were 0.88 tons/acre and EC was 0.72 dS/m, and again in 1977, a Critically Dry year, when yields were 0.89 tons/acre and EC was 1.49 dS/m, the highest EC during the sample period.

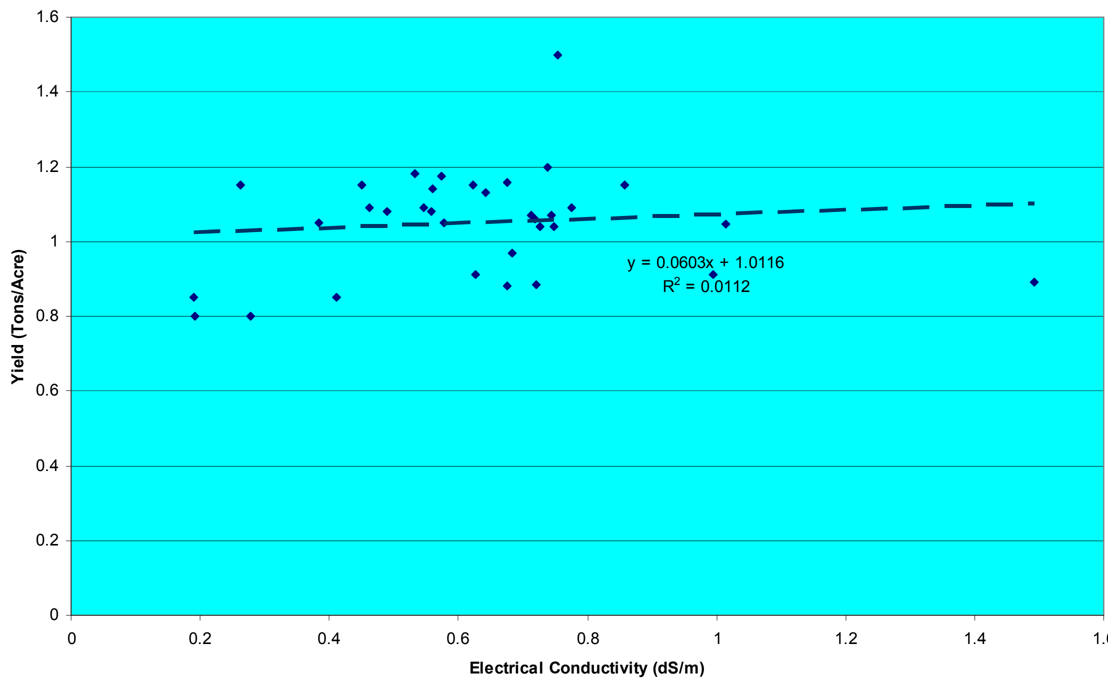
None of the other eleven instances in which seasonal average EC exceeded the Vernalis Irrigation Season Salinity Objective accompanied significant declines in bean yields. Eight of these years had yields at or above the mean. Some of these years even had the best yields of the entire thirty-three year period. In fact, the highest yields in the entire period, 1.5 tons/acre, occurred in 1990, when the average EC of the season was 0.75 dS/m! In contrast, 1997 had one of the worst yields, at only 0.8 tons/acre, but the best water quality, at 0.19 dS/m.

South Delta farmers such as Mr. Salmon and Mr. Sharp have repeatedly claimed that violations of the Vernalis Irrigation Season Salinity Objective lead to corresponding

[11] The standard deviation was 0.17 dS/m.
[12] The standard deviation was 0.10 tons/acre. The median yield was 1.07 tons/acre

declines in their yields, yet they have also repeatedly failed to provide any documentation or other supporting evidence demonstrating a correlative or causal relationship between exceedances of the Vernalis Irrigation Season Salinity Objective and harm to their crops. They could not do so, because no such evidence existed. Comparing seasonal average EC at Vernalis with bean yields demonstrates that bean yields do not decrease when EC exceeds the Vernalis Irrigation Season Salinity Objective and that no relationship between the two exists. (See Figure 1.)

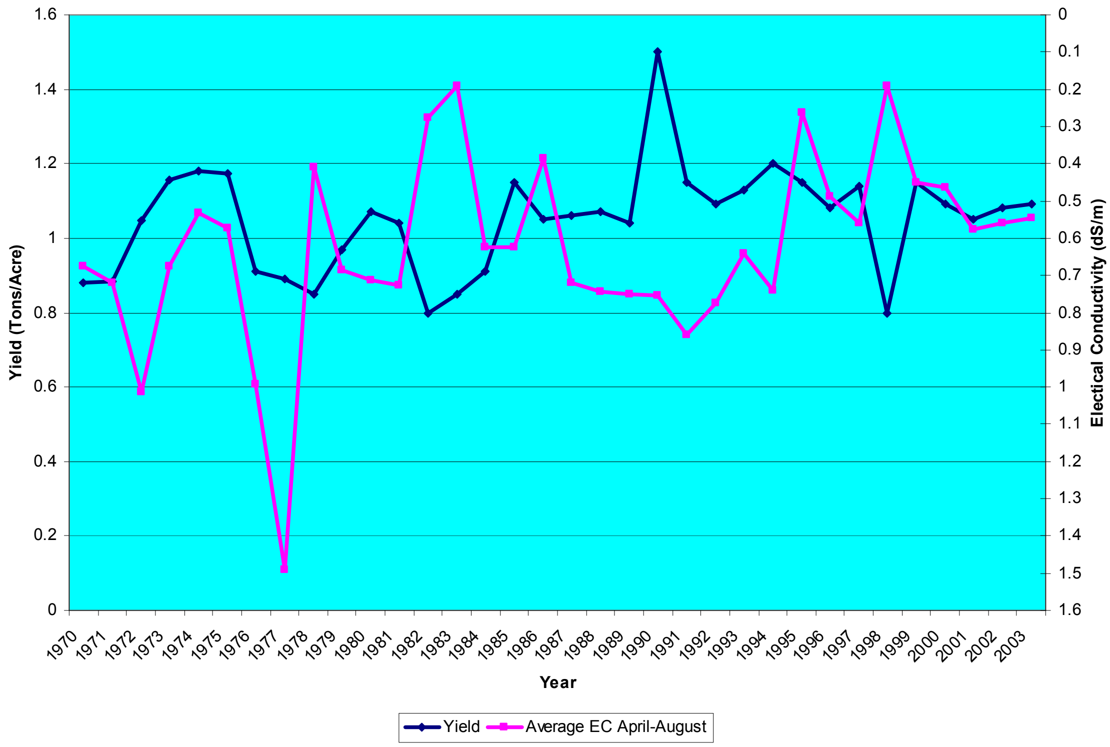
Figure 1: San Joaquin County dry bean yield and seasonal average water quality. (See Exhibit C.)



According to the work of Ayers and Westcot however, it takes time for salt to accumulate in the root zone to a concentration sufficient to reduce yield. (R. S. Ayers and D. W. Westcot, Water Quality for Agriculture §2.4.2 (FAO Irrigation and Drainage Paper, 29 Rev. 1, 1985).) Even without leaching, two or more years of irrigation are generally required before salt concentrations climb high enough to harm yields. (Id.)

Consequently, the SJRGA examined bean yields and water quality over the period from 1970 to 2003 to determine whether any patterns or trends emerged. Based on the Ayers and Westcot work, one or more consecutive years in which the seasonal average salinity exceeded 0.7 dS/m should have eventually led to declines in yields, but again there was no relationship between Vernalis water quality and bean yields. (Id.; See Figure 2.)

Figure 2: San Joaquin County dry bean yield and seasonal average water quality from 1970 to 2003. (See Exhibit C.)



In the entire thirty-three year period observed, there were two instances in which yields declined more than 10% below the mean after one or more years in which the seasonal average EC at Vernalis exceeded 0.7 dS/m.

The first instance occurred in 1977, when the yield was 0.89 tons/acre, the EC at Vernalis that year was 1.49 dS/m, and the EC at Vernalis the prior year was 0.99 dS/m.[13]

[13] In the 1970's and 1980's, the fifteen-year moving average of the mean annual discharge was about 800,000 AF. (2002 TMDL Report, p14.) The discharge at Vernalis in 1977 was only 400,000 AF and was

The second instance occurred in 1982, when yields were 0.85 tons/acre, and the seasonal average EC in the two prior years was 0.71 dS/m in 1980 and 0.73 dS/m in 1981.

However, there was also a significant period when seasonal average EC exceeded 0.7 dS/m every year from 1987 through 1992 - a total of six consecutive years. Throughout that period, however, bean yields stayed remarkably stable. In fact, they were higher than the mean in all six years. 1990, the fourth consecutive year in which seasonal average EC exceeded 0.7 dS/m, had the highest bean yields of the entire period from 1970 to 2003 (1.5 tons/acre). Such a long period of EC at Vernalis in excess of the salinity tolerance of beans defeats the notion that even violations over multiple, consecutive seasons correlate with or cause declines in yields.

The SJRGA also tried to find trends in corn, both grain (See Figure 3) and silage (See Figure 4), and alfalfa (See Figure 5), but the only trends found were inconsistent with the belief that violations of the Vernalis Objectives cause crop losses.

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the lowest annual discharge between 1930 and 1998. (Id.) It is therefore uncertain crop yields were impacted by poor water quality or insufficient supply.

Table 3: Corn grain, corn silage, and alfalfa yields and seasonal average water quality at Vernalis, 1970-2003.[14] (See Exhibit C.)

Year	Corn Grain Yield (Tons/Acre)	Corn Silage Yield (Tons/Acre)	Alfalfa Yield (Tons/Acre)	EC (dS/m)	Year Type
1970	3.14	22.75	6.33	0.68	AN
1971	3.25	20.50	6.70	0.72	BN
1972	3.15	25.00	6.63	1.01	D
1973	3.60	23.70	7.00	0.68	AN
1974	3.40	24.30	6.66	0.53	W
1975	3.59	22.11	6.54	0.57	W
1976	3.51	23.50	7.32	0.99	C
1977	3.95	21.40	7.47	1.49	C
1978	3.85	20.94	6.77	0.41	W
1979	4.03	24.87	6.86	0.68	AN
1980	4.40	24.14	6.48	0.71	W
1981	3.89	23.90	6.83	0.73	D
1982	4.50	24.20	6.93	0.28	W
1983	3.92	25.10	6.74	0.19	W
1984	4.47	24.51	6.95	0.63	AN
1985	4.70	27.30	7.31	0.62	D
1986	4.62	26.30	6.46	0.38	W
1987	4.70	26.60	6.79	0.72	C
1988	4.46	22.90	7.14	0.74	C
1989	4.64	24.50	6.90	0.75	C
1990	4.32	23.70	6.78	0.75	C
1991	4.67	26.90	7.30	0.86	C
1992	5.07	25.10	8.33	0.78	C
1993	5.04	26.10	7.00	0.64	W
1994	5.20	29.00	7.25	0.74	C
1995	4.97	27.73	7.25	0.26	W
1996	4.48	27.55	6.81	0.49	W
1997	5.14	27.18	6.98	0.56	W
1998	4.50	28.17	6.10	0.19	W
1999	4.95	28.15	6.32	0.45	AN
2000	5.13	28.89	6.22	0.46	AN
2001	4.76	29.87	7.2	0.58	D
2002	5.20	30.00	7.00	0.56	D
2003	4.63	28.35	7.11	0.55	BN

[14] Consecutive years in which the seasonal average exceeded the Objective are shaded pink.

Figure 3: San Joaquin County corn grain yields and seasonal average water quality from 1970 to 2003. (See Exhibit C.)

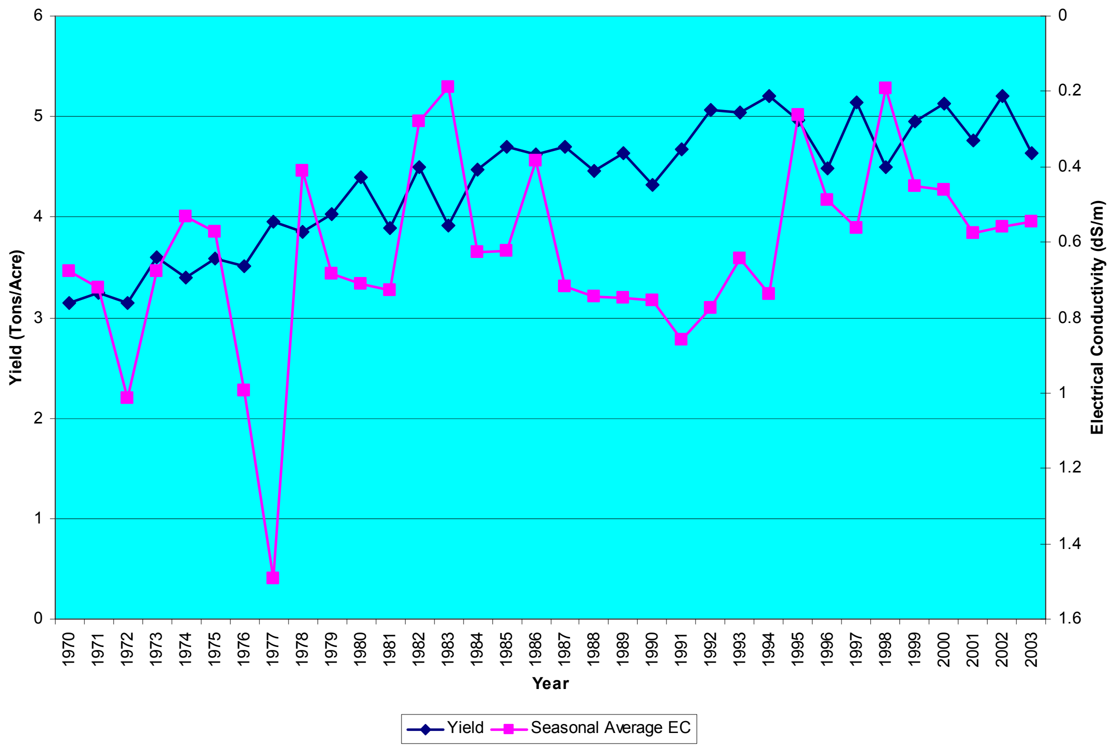
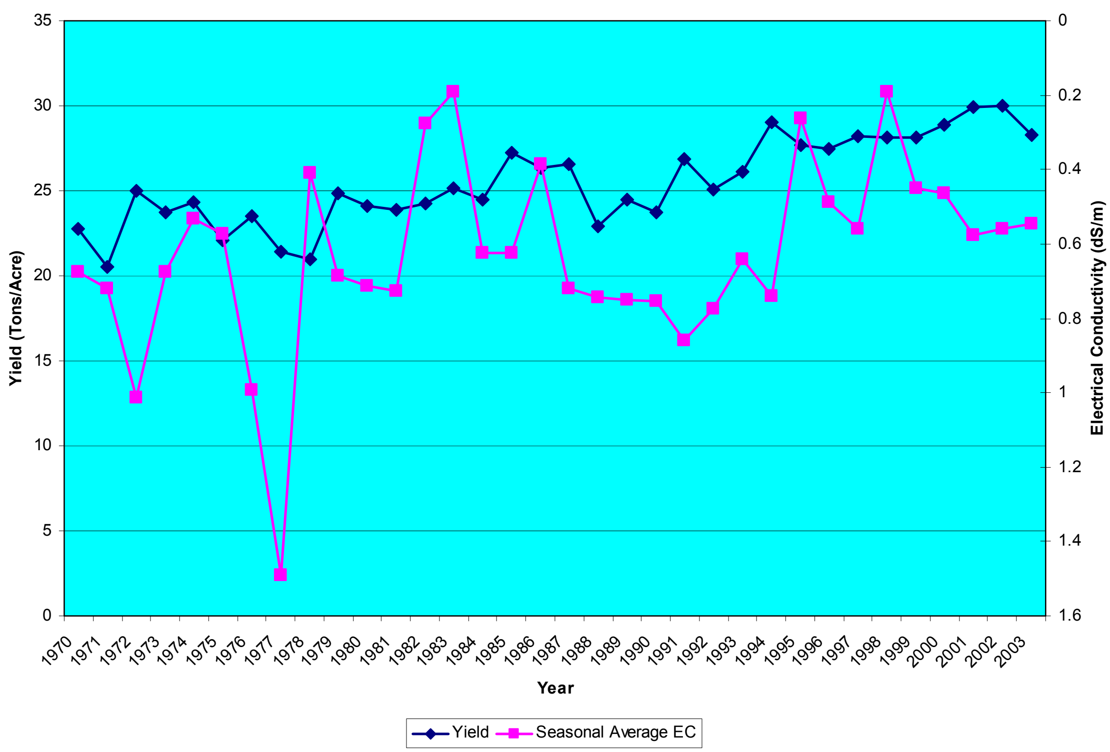


Figure 4: San Joaquin County corn silage yields and seasonal average water quality from 1970 to 2003. (See Exhibit C.)



Corn grain and corn silage yields steadily increased over the period of 1970 to 2003. (See Figures 4 and 5.) Corn grain yields continued rising in 1977, and continued doing so in 1978. Corn grain yields even continued rising throughout the period from 1987 to 1992, when seasonal average EC exceeded the Vernalis Irrigation Season Salinity Objective every year. Silage corn yields had a similar trend. Yields decreased slightly in 1977 and 1978, but then increased again in 1979 and returned to their upward trend. However, the work of Ayers and Westcot does not predict declines in corn yields until the EC of the applied irrigation water exceeds 1.1 dS/m. (Ayers and Westcot, Water Quality for Agriculture §2.4.3.) In the entire thirty-three year period, seasonal average EC at Vernalis only exceeded 1.1 dS/m in one year, 1977. The conventional wisdom would have predicted declines in the yields of both grain corn and silage corn, but instead grain corn yields increased!

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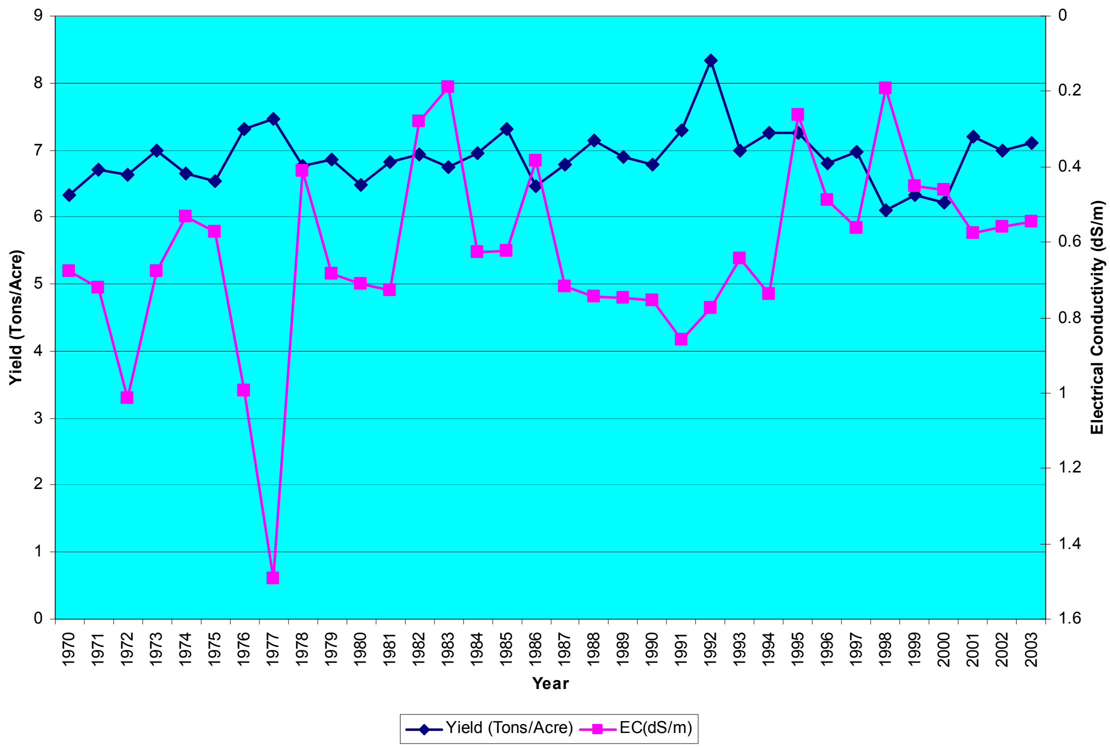
Figure 5: San Joaquin County alfalfa yields and seasonal average water quality from 1970 to 2003.



Alfalfa yields stayed relatively stable from 1970 to 2003. (See Figure 5.) Alfalfa yields even increased between 1987 and 1994, when the seasonal average EC at Vernalis exceeded 0.7 dS/m in six out of seven years. Even consecutive years of seasonal average EC at Vernalis exceeding 0.7 dS/m failed to adversely impact alfalfa yields. The highest yields of the entire period, 8.33 tons/acre, occurred in 1992, which was the fourth consecutive year seasonal average EC at Vernalis exceeded 0.7 dS/m. However, the work of Ayers and Westcot does not predict declines in alfalfa yields until the EC of the applied irrigation water exceeds 1.3 dS/m. (Ayers and Westcot, Water Quality for Agriculture §2.4.3.) In the entire thirty-three year period, seasonal average EC at Vernalis only exceeded 1.3 dS/m in one year, 1977. Contrary to conventional wisdom however, alfalfa yields did not decline that year, but increased instead.

The SJRGA's analysis was based on information obtained from the San Joaquin County Agriculture Commission, rather than data specific to the south Delta, but south Delta agriculture constitutes a significant percentage of San Joaquin County agriculture. In 1996, the most recent land use survey data available from the DWR, the southern Delta alone accounted for over 46% of San Joaquin County's bean production. (Exhibit G, p2, 56.) About 10,550 acres of bean were grown in the southern Delta, while 22,800 acres of beans were grown in San Joaquin County. (Id.) Alfalfa constituted an even larger portion of San Joaquin County output, about 55%, with 35,600 acres of alfalfa grown in the south Delta and 64,890 acres grown in San Joaquin County. (See Exhibit C, Table 7.) Corn grown in the southern Delta, both grain and silage, accounted for about 24% of San Joaquin County output, a smaller portion than beans and alfalfa. (See Exhibit G, p40, 48.) Nevertheless, since the south Delta accounts for such a large percentage of county output, San Joaquin County statistics adequately represent southern Delta bean, corn, and alfalfa statistics.

San Joaquin County yields of grain corn, silage corn, and dry beans are substantially better than average yields in the United States and even California by up to 20%. (Exhibit G, p8, 17, 23.) San Joaquin County grain corn and silage corn yields even exceed those of major corn growing states such as Nebraska. (Id., p8.) If these crops were impacted by excessive salt and boron, then one would expect average or below-average yields compared to the norm, rather than yields substantially better than the norm!

If the South Delta farmers were correct in their beliefs, then corn, alfalfa, and especially bean yields should have declined in relation to violations of the Vernalis Objectives. Contrary to conventional wisdom and the deeply-held beliefs of many, historical data disproves the existence of any correlation or causal relationship between EC's at Vernalis and impacts to south Delta agriculture.

C. Assumptions Underlying the Development of the Vernalis Objectives in D-1485 Were Incorrect.

Since the historical data showed no impact on crop yields due to violations of the Vernalis Objectives, the SJRGA re-examined the information used to establish Vernalis Objectives in D-1485, and found that some of the fundamental assumptions forming the foundation of D-1485 were either incorrect or outdated. As a result, the Vernalis Objectives are virtually irrelevant to south Delta agriculture and exceedances, if they did occur, would not substantially affect beneficial uses.

1. Data Used to Establish the Vernalis Objective Did Not Account for Rainfall.

As discussed in the testimony of Dr. James Brownell, the initial work on establishing crop salinity relationships, which was later used by the SWRCB in D-1485, was done in large pots, under controlled conditions and did not consider leaching due to natural rainfall. (See Exhibit F, p1.)

For example, the SWRCB considered the 1974 UC-Committee of Consultants developed "Guidelines for Interpretation of Water Quality for Agriculture" (1976 UC Exhibit 1), which evaluated the interrelationship between the salinity of the irrigation water, the soil salinity, and the leaching fraction to determine the impact on crop yields. Another exhibit submitted by the University of California Agricultural Extension (1976 UC Exhibit 7), similarly evaluated only the impacts of the salinity of the irrigation water actually applied. UC Exhibit 3 predicted yield declines based upon crops grown under controlled circumstances, with salinity of the irrigation water applied at one of two fixed amounts, 1.35 dS/m and 2.0 dS/m. (1976 UC Exhibit 3.)

Agronomy research continued after D-1485 and began incorporating the effects of rainfall. The SWRCB considered much of this material when it re-examined the Vernalis Objectives in the late 1980's. In 1983, Prichard, Hoffman, and Meyer determined that the winter rainfall observed in their study generally leached surface soils free of salts and allow good seed germination. (Ayers and Westcot, Water Quality for Agriculture §8.2.) With such conditions, corn could be irrigated with an EC_w as high as 2.2 with no loss in yield. (See Exhibit F, p5.)

In 1986, Hoffman et al. obtained similar result when they reported that 100% yields of corn could be achieved using irrigation water with an EC_w as high at 2.0 dS/m if leaching were adequate from either winter rain or irrigation to reduce the average soil water EC_e below the tolerance threshold. (See Exhibit H, p5.) Even sub-irrigation with irrigation water with an EC_w as high as 1.5 dS/m failed to reduce corn yields. (Id., p5.) If leaching was inadequate, maximum yield was impossible even with non-saline water. (Id.)

Ayers and Westcot compiled additional information in 1985, including a model derived from previous work performed at the United States Department of Agriculture Salinity Laboratory in 1977 by Maas and Hoffman. (See Exhibit F, p1.) Ayers and Westcot assumed the plant root zone was divided into four equal quarters where the plant extracted forty percent of its water from the top quarter, thirty percent from the second quarter, twenty percent from the third quarter, and ten percent from the bottom quarter. (Id.) It also assumed a 15% leaching fraction and the occurrence of no rainfall. (See

Exhibit J, p11.) Based on these assumptions Ayers and Westcot concluded irrigation water with an average root zone salinity of 1.0 dS/m, the salinity threshold for beans, would require irrigation water with an EC_w of 0.7 dS/m. (Id.) Even though their work excluded rainfall, they recognized rainfall could provide additional leaching benefits beyond that provided by irrigation water alone by stating

> "Rainfall **must** be considered in estimating the leaching requirement..[rainfall] in excess of ET... will satisfy all or part of the leaching needed to control salts. The advantage of rainfall in accomplishing all or part of the leaching is that it uniformly applies an almost salt-free water (EC_w<0.05 dS/m.)" (Ayers and Westcot, Water Quality For Agriculture §2.4.2.) (emphasis added)

Hoffman, Prichard and Meyer later developed a mathematic equation to quantifying the impact of rainfall. (Hoffman, p1.) Using this equation, they predicted relative crop yield using the same assumptions used by Ayers and Westcot, except one scenario lacked rainfall and the other include "normal effective rainfall." (Hoffman, Table 5.) In the scenario without rainfall, the maximum irrigation water EC_w able to maintain 100% yield of beans was 0.8125 dS/m. With "normal effective rainfall" however, 100% yields were attainable with irrigation water EC_w's as high as 0.906 dS/m. (Hoffman, Table 5.)

Despite recognition that natural rainfall was a factor in predicting the maximum salinity in irrigation water protective of 100% crop yield, research excluding rainfall essentially supported the existing 0.7 dS/m water quality objective. (Hoffman, Table 5; (Ayers and Westcot, Water Quality for Agriculture §2.4.2.) Apparently giving more credence to the predictions that did not include rainfall, the SWRCB left the Vernalis Summer Objective unchanged. In doing so, the SWRCB has maintained a standard which is objectively over-protective of the south Delta agricultural beneficial uses. (See Exhibit F, p9.) As a result, even when violations have occurred, agriculture has not been affected.

2. The SWRCB Developed a Policy Protecting Sub-Irrigation on Organic Soils, Which are Rare in the South Delta.

In the D-1485 proceedings, the SWRCB was concerned about the large amount of corn grown on organic (peat) soils using sub-irrigation. (See Exhibit D, 2.)
Their concern was misplaced however, because almost all of the soil in the south Delta is mineral soil. A review of the San Joaquin County soil survey shows there are no organic soils south of the Grant Line Canal. (See San Joaquin County Soil Survey; see also Exhibit H, p15-19, Figures 12 through 17.) The only organic soils in the south Delta are within the boundaries of the CDWA. (Id.)

Mr. Hildebrand corroborated the absence of organic soils in the south Delta in testimony before the SWRCB in 1987, which stated

> "let us examine the source and nature of the technical information which is needed in order to make a valid application in the South Delta of generalized data on applied water quality versus crop yield. You heard a lot about peat soils, but **ours are mineral soils**. **Some are below sea level, but most are above summer mean levels**." (See Exhibit O, p2-3 (includes Bay-Delta testimony from Mr. Hildebrand from the 1980's).)

Mr. Hildebrand further testified that

> "The "Report on the Salt Tolerance of Corn in the Delta" by the U.S. Salinity Laboratory, et al. was based on peat lands. **It, therefore, has limited applicability in the South Delta**." (Id., p12.) (emphasis added.)

The SWRCB improperly designed the Vernalis Objectives to protect crops grown on organic soils, because it improperly assumed there were organic soils in the south Delta. (See Exhibit H, p15-19, Figures 12 to 17.) Then, as now, the SWRCB should have focused on the data and testimony concerning the affects of salinity on salt sensitive crops such as beans which are grown in mineral soils with surface irrigation. (See Exhibit H, p15-19, Figures 12 to 17.)

3. Fish and Agriculture Barriers Limit the Reach and Influence of San Joaquin River Water.

The development of the Vernalis Objectives in D-1485 also relied on a critical, fundamental assumption – that south Delta agriculture uses San Joaquin River water for irrigation and therefore EC at Vernalis influences EC elsewhere in the south Delta. To determine the hydrologic relationship between Vernalis and other parts of the Delta, Ms. Susan Paulsen used the Fischer Delta Model ("FDM") to simulate hydrodynamics and salinity within the Delta. (See Exhibit I, p1.) As explained in her presentation, once operations of the Head of Old River Barrier ("HORB"), Grant Line Canal Barrier ("GLCB"), Middle River Barrier ("MRB"), Old River Barrier at Tracy ("ORB"), and Delta Cross Channel Barrier ("DXC") begin in April, and until they end in December, almost 100% of the water from the San Joaquin River remains in the San Joaquin River. (Exhibit I, p12; see Figures 6 and 7.)

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Figure 6: Flow split at confluence of Old and San Joaquin Rivers with standard HORB schedule. (Exhibit I, p12.)

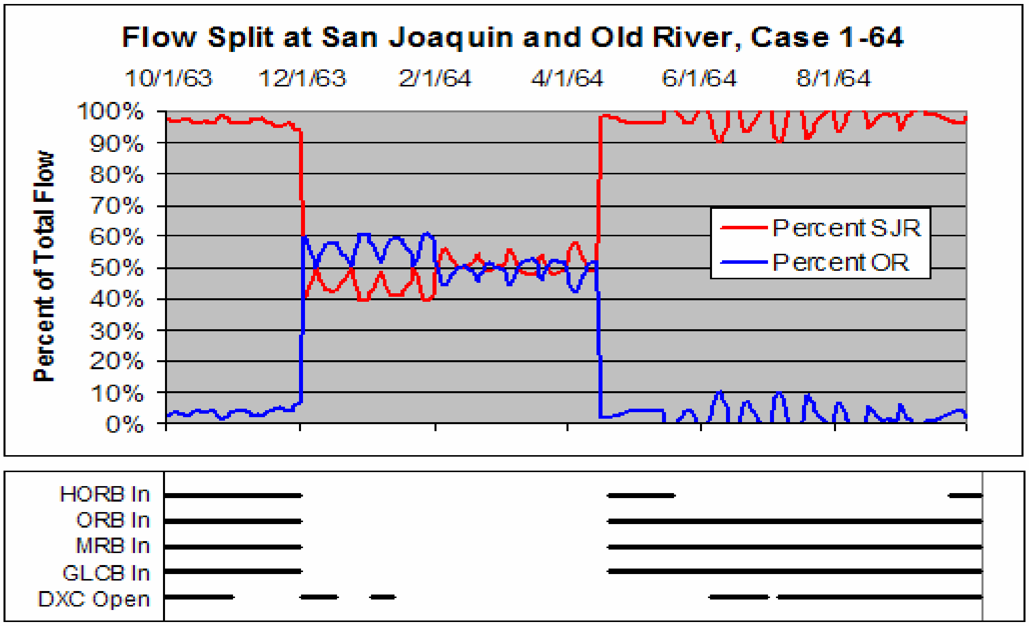
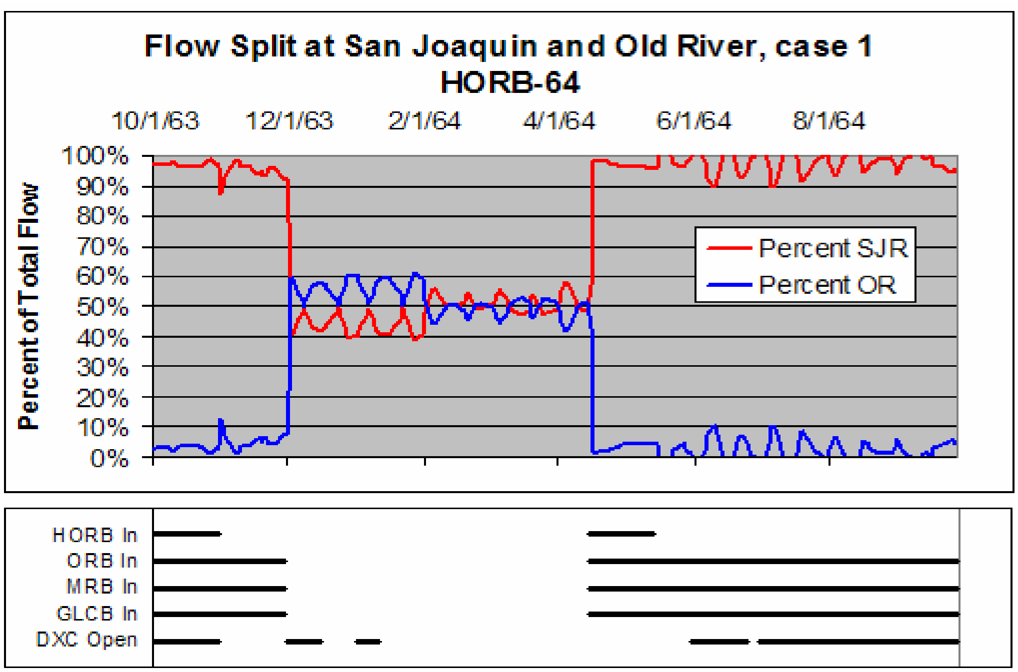
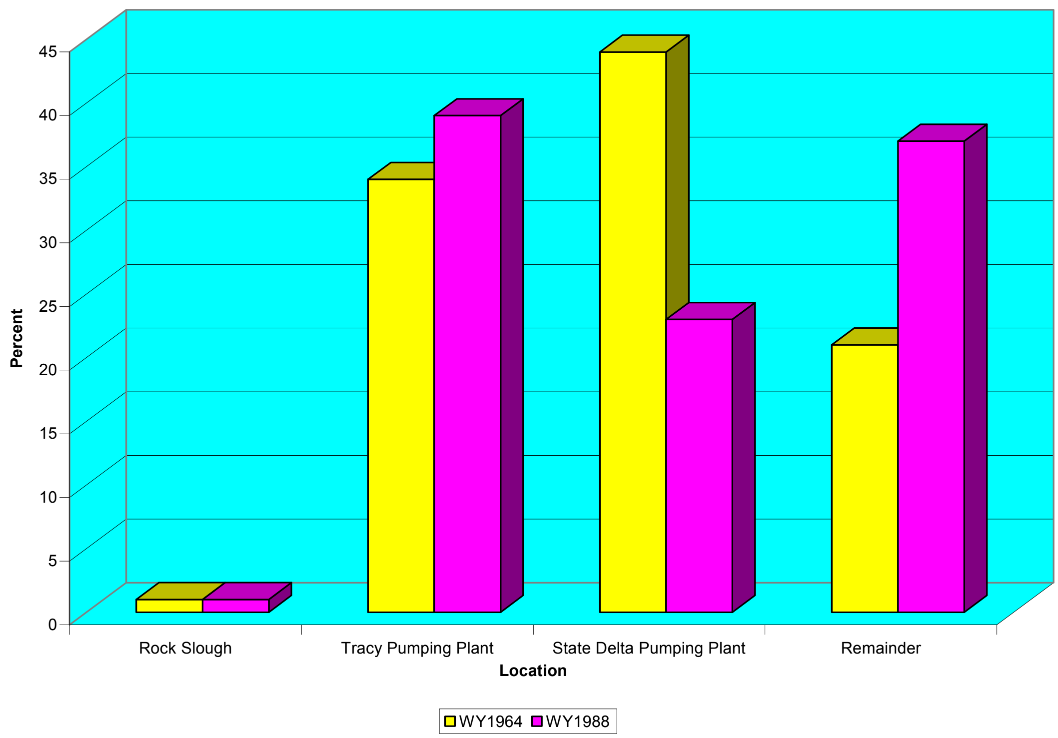


Figure 7: Flow split at confluence of Old and San Joaquin Rivers with modified HORB schedule. (Exhibit I, p12.)



Ms. Paulsen also analyzed the effects of exports. In a Dry year, only 21% of San Joaquin River water remains in the Delta.[15] (Id., p4, 11; see Figure 8.) The rest of the water is exported. (Id.) In a Critical year, only 37% of San Joaquin River water remains in the Delta.[16] (Id.) As in Dry years, the remaining water is exported. (Id.)

Figure 8: Fate of San Joaquin River Water in Water Years 1964 and 1988. (Exhibit L, p4.)



Finally, Ms. Paulsen added a tracer to further isolate the fate of San Joaquin River water. She determined that in an Above Normal year, no more than 18.5% of San Joaquin River water flowed into Turner Cut. [17] (See Exhibit L, p13-14.) Even in a Dry year, when a greater proportion of water remains in the Delta, no more than 23% of San Joaquin River water enters Turner Cut.[18] (Id.) These simulated percentages, as low as they may

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[15] Ms. Paulsen modeled water year 1964 as the Dry year. (See Appendices I and L.)
[16] Ms. Paulsen modeled water year 1988 as the Critical year. (See Appendices I and L.)
[17] Water year 2000 was used to simulate the Above Normal year. (Exhibit M.)
[18] Water Year 2001 was used to simulate the Above Normal year. (Exhibit M, p3.)

appear, actually overestimate the amount of San Joaquin River water flowing into Turner Cut, because the FDM sometimes counts tracers multiple times.[19] Therefore, the amount of San Joaquin River water entering Turner Cut is less than that predicted by the simulation. (Id.)

Together, the barriers and exports prevent almost all of the San Joaquin River's water from entering Old River and effectively eliminate any significant hydrologic relationship between Vernalis and the interior south Delta during the summer irrigation season and thwart any significant influence EC at Vernalis can have on EC on Old River at Middle River, Old River at Tracy Road Bridge, or other locations in the interior south Delta. (See Exhibit I, p12.) Once the San Joaquin River reaches the Stockton Deep Water Ship Channel, water from San Joaquin River joins the Sacramento River. (Environmental Impact Report ("EIR") for the 1995 WQCP, pIII-104, III-106; Exhibit G, p5-6.) Very little of the water in Turner Cut, Paine Slough, the Grant Line Canal, and other areas in the interior southern Delta comes from the San Joaquin River. (Id.) Instead, most water comes from the Sacramento River. (Id.) As a result, the interior south Delta is irrigated primarily with Sacramento River water, and the most fundamental assumption underlying the Vernalis Objectives, that San Joaquin River water irrigates crops in the south Delta, is wrong.

Thomas M. Zuckerman, a farmer on the Rindge Tract, corroborated Ms. Paulsen's analysis. He testified that, due to the "myriad of channels and connections to the Sacramento River, both natural and constructed as part of the Central Valley Project", the

[19] On Tables 2 and 3, the CVP, SWP, Los Vaqueros, and Contra Costa export columns, plus the Martinez column should total approximately 100%. (Exhibit M, p13-14.) If they total less than 100%, the remaining percentage represents water remaining in the Delta. The sum of the Old River, Stockton Ship Channel, Turner Cut, Columbia Cut, Little Connection Slough, and Middle River columns will exceed 100%, because the tracers are counted multiple times.

water he pumps comes from either the Sacramento or Mokelumne River, not the San Joaquin. (Bay-Delta, Depo. Tr. Thomas A. Zuckerman, p33-34 (May 25, 1999).)

Ms. Paulsen's analysis further refutes the testimony of Mr. Salmon. (See Exhibit B, p47.) Mr. Salmon describes declines in the yields of walnuts and grapes grown at his farm at the east end of the Grant Line Canal. (See Exhibit B, p47.) No correlation existed between his crop yields and EC at Vernalis however, because in the irrigation season there is no significant hydrologic relationship between the water he diverts and the water at Vernalis. (See Exhibit I, p12; see §III(A), *supra*.) Even if Mr. Salmon, the SDWA, or others had evidence demonstrating a correlation between the EC of the water Mr. Salmon diverts and EC at Vernalis, the lack of any significant hydrologic relationship forecloses the existence of any causal relationship.

The Vernalis Irrigation Season Objective was set at a level of salinity sufficient to protect the yields of beans, the most salt-sensitive crop grown in the south Delta[20], but due to the combined effects of exports and barriers, the Vernalis Irrigation Season Objective only provides substantial protection to crops irrigated with San Joaquin River water upstream from the Stockton Deep Water Ship Channel and east of the HORB. (See Exhibit H, p20-21, Figures 18 and 19.) About 3,000 acres of beans are grown in this area[21], and almost all of them are located in the Banta-Carbona Irrigation District

[20] Mr. Hildebrand testified that beans are so salt sensitive that as the irrigation water became saltier, beans in the south Delta were replaced with corn. (Exhibit O, p10.) In fact, Mr. Hildebrand testified that so much corn was grown that there a surplus. (Id.)

[21] Drs. Hagen and Mason estimated that, based on the rate of decline in bean production in San Joaquin County, 4,346 acres of beans would be grown in the south Delta in 2003. (Exhibit G, p2.) In 1996, about 75% of the beans were irrigated with surface water. (Id.) Assuming the proportion of beans irrigated with surface water remained constant, about 3,259 acres of beans would have been irrigated with surface water in 2003.

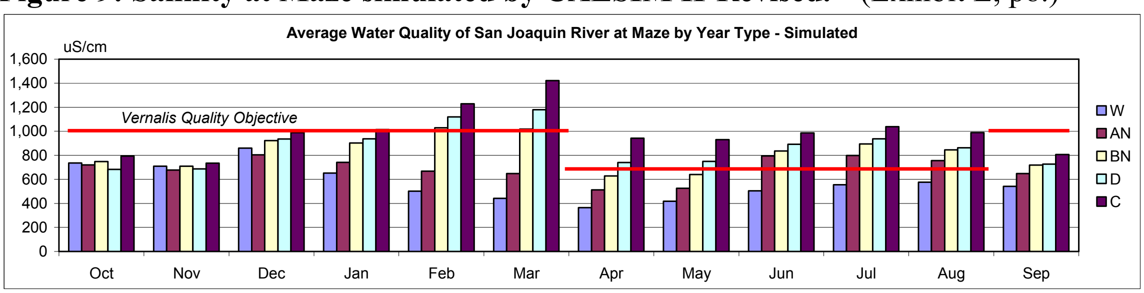
("BCID").[22] Consequently, the Vernalis Summer Objective only protects 3,000 acres of beans.

V. The Vernalis Objectives Will Always Be Met.

The latest version of CALSIM II ("CALSIM II-Revised"), developed by Mr. Dan Steiner for the USBR, is the product of over three years of refinement and enhancement of prior models used to simulate the hydrology and water resource operations of the LSJR Basin.[23] (Exhibit E, p17.)

CALSIM II-Revised first analyzes "Maze", the San Joaquin River upstream of its confluence with the Stanislaus River, because conditions at Maze drive conditions at Vernalis. (Id., p14.; See Figure 9.) Here, it captures the effects of upstream operations of the Merced River and Tuolumne River, and occasional flow from the upper San Joaquin River and Kings River. It analyzes water quality using a new mass balance approach. (Id.) Then, it presents results for Vernalis. (Id.; See Figure 10)

Figure 9: Salinity at Maze simulated by CALSIM II-Revised.[24] (Exhibit E, p8.)



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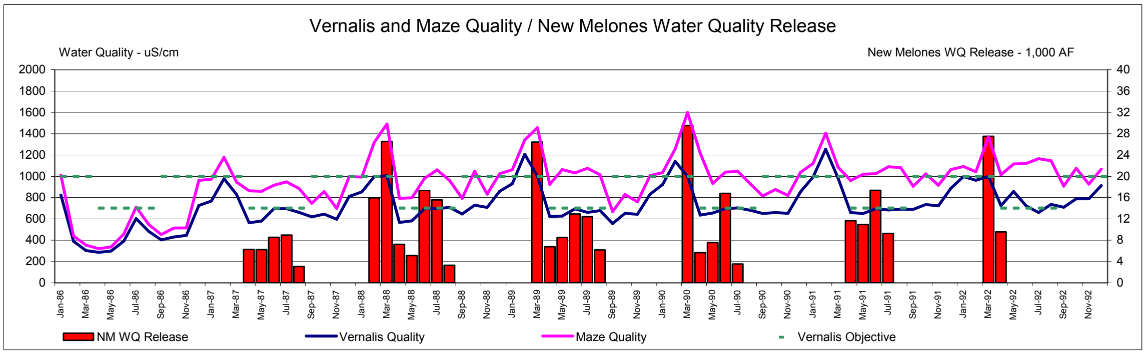
[22] In 2003, about 2,300 acres of beans were grown in the BCID. (Exhibit G, p2.)
[23] CALSIM, and subsequently CALSIM II, were designed and implemented to replace DWRSIM, one of the planning models used to develop the TMDL for the salt and boron in the LSJR. (Department of Water Resources, Office of State Water Project Planning, Modeling Support Branch, Computer Models, http://modeling.water.ca.gov/hydro/model/description.html.)
[24] Note that EC is depicted in "uS/cm." For purposes of conversion, 1000 uS/cm = 1 dS/m.

Figure 10: CALSIM II-Revised simulation of San Joaquin River salinity at Vernalis. (Exhibit E, p16.)



CALSIM II-Revised significantly improves on prior modeling efforts. SANJASM, the original Kratzer equation, and prior versions of CALSIM II all overestimated salinity at Maze, and in turn overestimated releases from New Melones for water quality. (Id., p19.) These prior models overstated salt loading in the lower San Joaquin River occurring in the summer months and, as a result, exaggerated the LSJR salinity problem, and led the SWRCB to believe the problem was more serious than it was in reality. (Id., p19-20; See Figure 11.)

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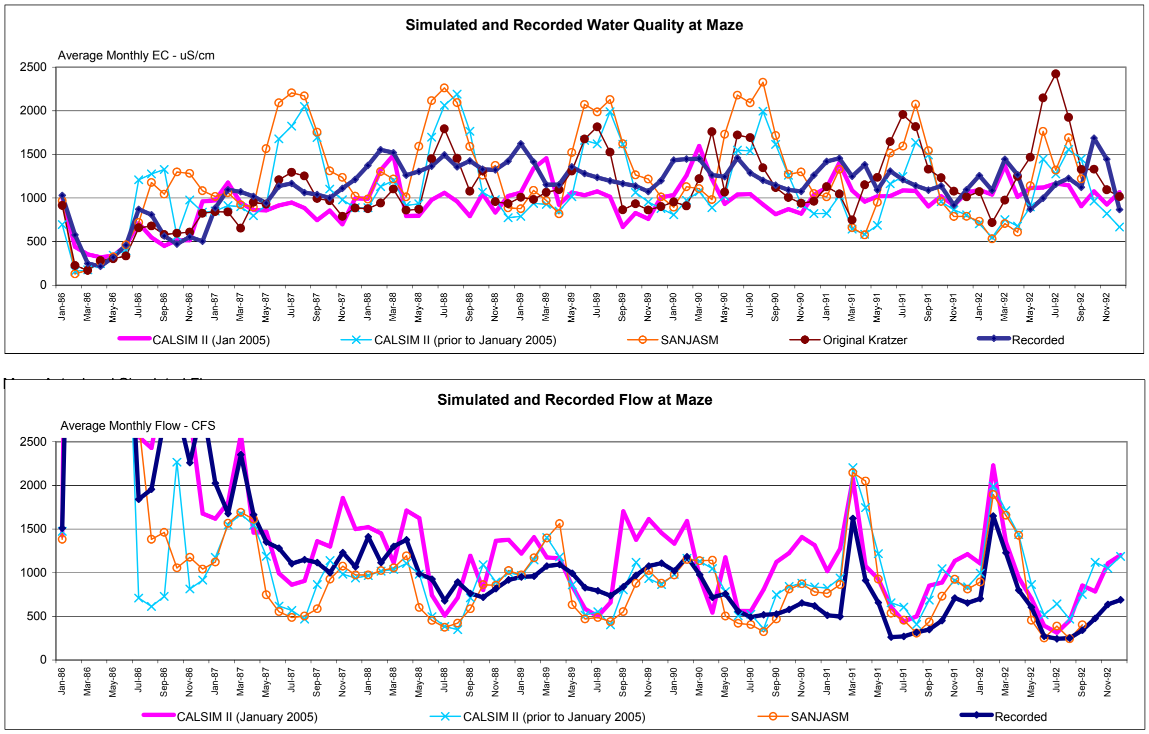
Figure 11: Comparison of CALSIM II-Revised to salinity and flow at Maze simulated by previous models and to historical water quality and flow.[25] (Exhibit E, p17.)



CALSIM II-Revised incorporates current river and water resource management methods, and, as a result, simulates different historical conditions than were actually experienced. (Id., p20.) CALSIM II-Revised also incorporates the effects of new projects, such as the Vernalis Adaptive Management Plan, the Grasslands Bypass Project, and the New Melones Interim Plan of Operations ("IPO"), which have changed the river's hydrology from conditions existing in the past. It has been refined and calibrated against recent recorded data, and more accurately models current river hydrology and actual salinity conditions. (Id.) "Major operational changes caused by the Central Valley Project Improvement Act… and the Vernalis Adaptive Management Program have… changed

[25] Note that EC is depicted in "uS/cm." For purposes of conversion, 1000 uS/cm = 1 dS/m.

the LSJR's hydrology." (2002 TMDL Report, p56.) These changes are captured by CALSIM II-Revised.

Using CALSIM II-Revised to simulate historic conditions with current river and water resource management practices shows that in the 73-year data set, 15 violations of the Vernalis Irrigation Season Salinity Objective would have occurred if New Melones were operated with strict adherence to the IPO. (Id., p12-13; See Table 5.) Given that each violation counts as a month and in the 73-year data set there were 876 months, violations would have occurred less than 2% of the time. (Id., p12-13.) Of the 15 violations, 10 would have occurred in the summer.

Table 5: Violations of the objective at Vernalis.[26] (Exhibit E, p13.)

Average Monthly Water Quality at Vernalis - Simulated (uS/cm)												
WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935	C	C	C	C	1080	C	C	C	C	C	C	C
1961	C	C	C	C	1058	C	C	C	C	C	717	C
1977	C	C	C	C	C	C	C	C	C	C	710	C
1988	C	C	C	C	C	C	C	C	C	C	708	C
1989	C	C	C	C	1207	C	C	C	C	C	C	C
1990	C	C	C	C	1139	C	C	C	C	C	C	C
1991	C	C	C	C	1253	C	C	C	C	C	C	C
1992	C	C	C	C	C	C	749	1011	723	C	737	C
1994	C	C	C	C	C	C	C	C	735	718	725	C
Notes:	"C" means water quality was within compliance for month. Exceedence during April or May is during non-pulse flow period.											
Water Quality Objective - uS/cm												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	1000	1000	1000	1000	1000	1000	700	700	700	700	700	1000
Estimated Additional New Melones Release Needed to Provided Water Quality Compliance - 1,000 acre-feet												
WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935					10							
1961					7						2	
1977											1	
1988											1	
1989					20							
1990					15							
1991					22							
1992							6	21	1		3	
1994									4	1	2	
End of Month New Melones Storage - 1,000 acre-feet												
WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935	584	580	583	616	640	690	820	1012	1127	1074	1001	958
1961	1201	1216	1231	1239	1243	1224	1186	1132	1079	1023	966	934
1977	1448	1444	1436	1428	1400	1339	1273	1209	1181	1124	1069	1047
1988	1443	1424	1410	1414	1404	1361	1298	1222	1182	1145	1109	1081
1989	1045	1029	1022	1020	1029	1079	1047	1002	984	932	882	886
1990	906	908	923	936	952	920	856	786	733	676	633	609
1991	598	580	589	587	584	626	594	558	521	461	404	385
1992	382	371	386	400	450	467	441	361	308	252	194	166
1994	716	738	772	802	825	775	723	675	619	552	490	455

[26] Only violations of the Objective are shown. Violations are shaded pink. For purposes of conversion, 1000 uS/cm = 1 dS/m.

The largest violation of the Vernalis Irrigation Season Salinity Objective, and the largest violation of either of the Vernalis Objectives in the entire 73-year period, would have occurred in May, 1992, when the Vernalis Irrigation Season Salinity Objective was exceeded by 0.311 dS/m.[27] (Id.) All other violations of the Vernalis Irrigation Season Salinity Objective would have exceeded the objective by less than 0.05 dS/m. (Id.) Meeting the Vernalis Irrigation Season Salinity Objective in May, 1992, would have required 21,000 AF of water, but all other violations would have required 1,000 AF to 6,000 AF of additional water.[28] (Id.)

For every violation, New Melones had more than sufficient water available in storage to achieve the Vernalis Objectives. The USBR uses the IPO to determine when to release water from New Melones and how much water to release when a release is made. (Bay-Delta Hrg. Tr. Lowell Ploss, p195-196 (April 21-22, 1998).) Additionally, the IPO projects how much water New Melones will retain in storage for the remainder of each year. (Id.) By managing releases and storage, the IPO can insure an adequate supply of water in the event of a prolonged drought. (Id.) As Mr. Lowell Ploss, then the head of CVP operations for the United States Bureau of Reclamation ("USBR"), stated in D-1641, the USBR would do everything possible to meet salinity objectives. (D-1641; Bay-Delta Hrg. Tr. Lowell Ploss, p6553-6554 (November 10, 1998).) Since 1995, the USBR has met, or exceeded, the Vernalis Objectives. (Exhibit A, Declaration of Daniel B. Steiner; See also Exhibits P and Q.)

[27] Despite the exceedance in May, 1992, yields for dry beans, the most salt-sensitive crop grown in the south Delta, were far above the mean yield for San Joaquin County. (Exhibit G, p56.) 1992 was also a Critical year type following five consecutive Critical years. (Exhibit E, p32.)

[28] The average amount of water required to meet the Summer Vernalis for all 10 of the irrigation season violations would have been 8,400 AF. If the violation in May, 1992, is excluded, the average amount of water required would have been 2,333 AF.

In D-1641, the SWRCB required that the USBR meet the Vernalis Objectives and use "any measures available" to do so. (D-1641, p79, 89.) CALSIM II-Revised shows salinity objectives can be met.[29] Since the USBR can achieve the Vernalis Objectives, is legally required to do so, and has stated it will meet the Vernalis Objectives, the Vernalis Objectives will always be achieved. Boron objectives will always be achieved as well, since the Regional Board's linkage analysis demonstrates that meeting the Vernalis Objectives will also result in meeting boron objectives. (January 2002 TMDL, p87.) Even if the USBR violates their permit terms and conditions and strictly follows the IPO, the Vernalis Objectives will still be met over 98% of the time, which is still sufficient to require de-listing of the LSJR.

VI. The SWRCB is Reviewing the Vernalis Objectives and May Change the Standard from 0.7 dS/m to 1.0 dS/m.

The SWRCB is currently conducting its Periodic Review of the Bay-Delta Water Quality Control Plan ("Periodic Review") and has decided to review the Vernalis Objectives. As part of the Periodic Review, the SJRGA has recommended changing the Vernalis Objectives from an objective of 0.7 dS/m from April through August and 1.0 dS/m the rest of the year, to an objective of 1.0 dS/m for the entire year ("Alternative Objective").

Mr. Steiner used CALSIM II-Revised to model the effect of the Alternative Objective on flows and water quality. (Exhibit E, p21.) Currently, the Vernalis Irrigation Season Salinity Objective and the dissolved oxygen objective at Ripon require similar levels of release from New Melones. (Id.) As a result, the dissolved oxygen objective at Ripon drives Vernalis EC, and changing the Vernalis Irrigation Season Salinity Objective

[29] CALSIM II-Revised also shows flow objectives can be met, even without USBR releases of B(2) water.

does not significantly change releases from New Melones for EC at Vernalis.[30] (Id., p27; See Figures 12 and 13.)

Water quality on average would be about the same, although in Critical year types EC at Vernalis would increase by about 0.1 dS/m. (Id.) In Dry year types, the most marked change would occur in July, but even this change would only be about 0.05 dS/m. (Exhibit E, p26.) It should be emphasized, that such changes only occur when a 100 cfs flow surrogate is used. **If the current dissolved oxygen objectives at Ripon remain, EC at Vernalis does not change.** (Id.)

If the SWRCB adopts and implements the Alternative Objective, the new salinity objective will be 1.0 dS/m for the entire year. EC at Vernalis will never exceed 1.0 dS/m, even with the current IPO, violations will never occur, and as now, beneficial uses will not be impaired.

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[30] In CALSIM II-Revised, assumed operation of the IPO at New Melones "layers" one component of flow upon another, i.e., the fishery release is assumed to provide the "first" water in the river. (Exhibit E, p21.) Then, if required to meet the Objective, supplemental releases are made. (Id.)

Figure 12: Simulated water quality with current Vernalis Objectives. (See Exhibit E, p26.)

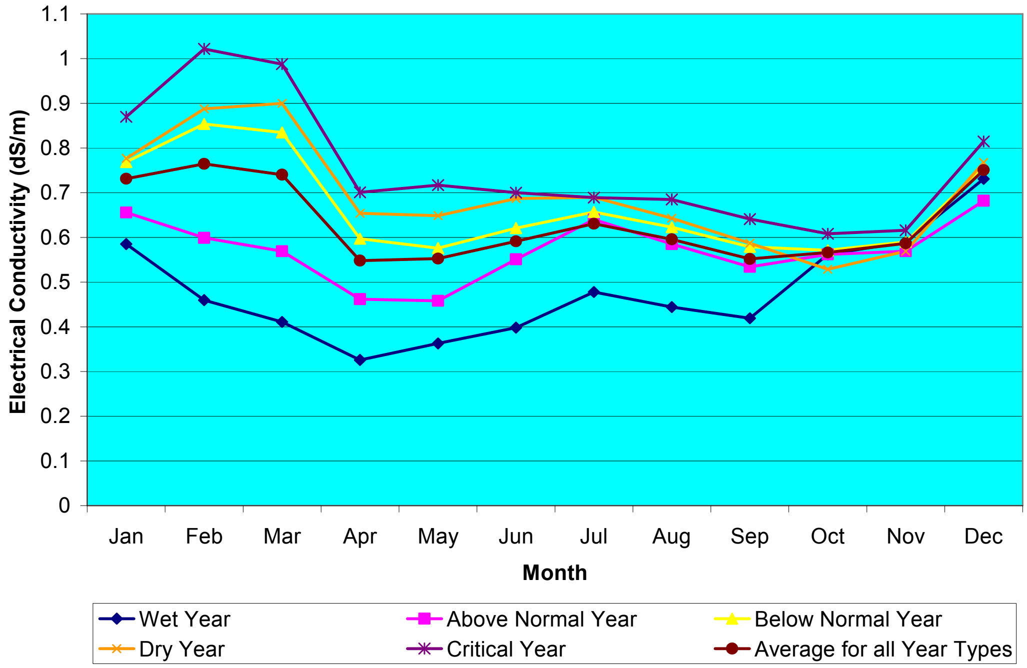
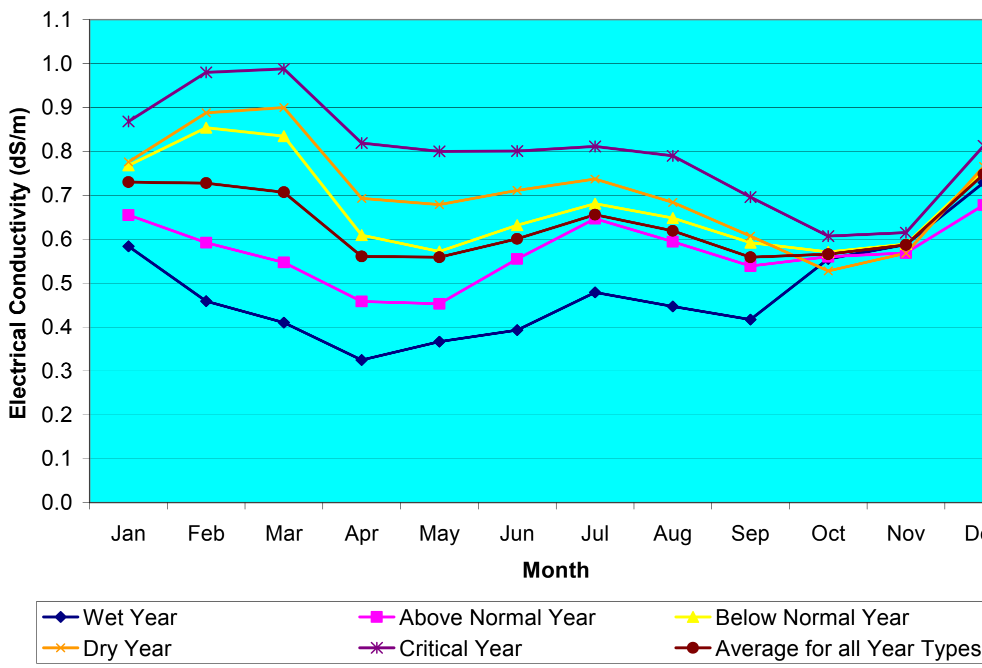


Figure 13: Simulated water quality with Alternative Objective.[31] (Id.)



[31] In Figure 10, the dissolved oxygen objective is been replaced with a 100 cfs surrogate.

VII. CONCLUSION

LSJR impairment due to EC is a myth. The myth started with a misunderstanding of the problem and has since been promulgated by endless chants by Delta farmers. Like most myths, there is no empirical or other evidence supporting the "belief." There have been no violations of the Vernalis Objectives in almost ten years. Exceedances of the Vernalis Objectives have never impacted south Delta agriculture, and no south Delta farmer has ever proved otherwise. Ten years of compliance without proof of harmful impact is enough, by itself, to require de-listing. In addition, the latest modeling, represented in CALSIM II-Revised, proves the EC problem was exaggerated, and with current river and water management practices, violations of the Vernalis Objectives will never occur. If the SWRCB changes the Vernalis Objectives to the Alternative Objective recommended by the SJRGA, violations will never occur. The SJRGA petitions the Regional Board to de-list the LSJR as a water body impaired by salt and boron.