Appendix 1B-2: Summary of Statistical Analyses of Water Quality in Water Conservation Area 2A

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To examine distribution of residuals, preliminary linear regression analyses were performed on conductivity, sulfate, and total phosphorus (TP) data using time as the independent variable. Examination (i.e., normal probability plots, histograms, skewness/kurtosis coefficients, and Shapiro-Wilk test) of the residuals from the TP data regression exhibited a skewed pattern. Because of this skewness, the TP data will be transformed using the natural log prior to linear regression analysis and analysis of variance (ANOVA). The residuals from the sulfate and conductivity data regressions did not deviate significantly from normality.

Linear regression analysis was used to statistically compare the general linear trend (i.e., slope) over time of TP, sulfate, and conductivity values between stations within each group. If a statistically significant difference existed between the trends in a group, then subgroups containing stations with trends not statistically different were created from the original group. Subgroups are essentially new groups and are statistically evaluated in the same manner as the original groups. Additionally, the Seasonal Kendall Tau test was used to calculate and statistically test the Sen Slope (i.e., change in concentration per year) for stations within each group. Finally, ANOVA was performed to statistically compare the central tendency (i.e., means) of the grouped stations.

Tables 1 through **3** summarize the data analyses performed for TP, sulfate, and conductivity, respectively. The "Group Slope" column (in the referenced tables) contains the results of the linear regression. The Seasonal Kendall Tau results are presented in the "Sen Slope" and "Sen Slope p-value" columns. The ANOVA results are presented in the "Stations With Geomeans Not Statistically Different" column for TP and "Stations With Means Not Statistically Different" column for sulfate and conductivity.

Table 1. Statistical analysis of total phosphorus at select stations in WCA-2A.

Group	Station	Stations With Geomeans Not Statistically Different	No. of Samples	Geometric Mean	Group Slope	Sen Slope (µg/l-year)	Sen Slope p-value
1	**E0**	F0 S10D	59	53.3	m=0	2.33	0.38
	F0	E0 S10D	58	61.8		-0.83	0.87
	S10C	All stations significantly different	29	25.7		-1.00	0.44
	S10D	E0 F0	67	48.3		0.00	1.00
2	**E1**	E2 E3 F2	37	30.7	m=0	-1.00	0.85
	E2	E1 E3	34	26.2		-1.00	0.72
	E3	E1 E2	36	22.2		-1.33	0.45
	F1	F2	93	43.2		0.00	1.00
	F2	E1 F1	116	35.4		-0.81	0.73
3	**E3**	F3	36	22.2	m=0	-1.33	0.45
	E4	F4	35	12.3		-0.63	0.15
	F3	E3	47	19.6		-1.38	0.46
	F4	E4	35	13.7		-0.75	0.31
	F5	All stations significantly different	38	9.7		0.00	1.00
4	**CA215**	All stations significantly different	78	5.2	m=0	0.00	0.83
	E5	U1 U2 U3	38	7.0		-0.33	0.63
	F5	U1 U3	38	9.7		0.00	1.00
	U1	E5 F5 U3	43	7.5		0.00	0.83
	U2	E5 U1 U3	37	6.8		-0.42	0.16
	U3	E5 F5 U1 U2	42	7.6		-0.33	0.27
6	**404Z1**	CA28 FS0.25 FS1.0	34	24.7	Parallel	-1.67	0.79
	CA28	404Z1 FS0.25 *FS1.0$_{0.049}$*	64	24.7		-2.50	0.13
	CA29	All stations significantly different	73	5.8		-0.38	0.20
	FS0.25	404Z1 CA28 FS1.0	10	19.7		<Year	NA
	FS1.0	404Z1 *CA28$_{0.049}$* FS0.25 FS2.0	10	17.3		<Year	NA
	FS2.0	FS1.0 FS3.0	10	12.0		<Year	NA
	FS3.0	FS2.0	10	8.4		<Year	NA
7	**C4**	S.25 S1 S2 S4	36	7.9	Parallel	-1.00	0.08
	S.25	C4 S1 S2 S4	8	11.7		<Year	NA
	S1	C4 S.25 S2 S4	7	8.7		<Year	NA
	S2	C4 S.25 S1 S4	37	8.6		-2.33	0.07
	S4	C4 S.25 S1 S2	46	7.7		-1.33	0.00
7.1	**S.25**	S1	8	8.7	m=0	<Year	NA
	S1	S.25	7	6.5		<Year	NA
7.2	**C4**	S2 S4	36	8.2	Parallel	-1.00	0.08
	S2	C4 S4	37	8.9		-2.33	0.07
	S4	C4 S2	46	8.0		-1.33	0.00
8	**C.25**	All stations significantly different	44	17.0	Parallel	-2.00	0.00
	C1	C2 N4	43	11.8		-3.00	0.00
	C2	C1 N4	36	10.6		-1.50	0.00
	N4	C1 C2	38	10.7		-1.67	0.00
	S4	All stations significantly different	46	8.1		-1.33	0.00
9	**N.25**	N1	43	21.6	m=0	0.75	0.92
	N1	N.25	44	19.2		-1.00	0.25
	N2	All stations significantly different	34	13.8	Parallel	-3.00	0.00
	N4	All stations significantly different	38	10.7		-1.67	0.00

Table 2. Statistical analysis of sulfate at select stations in WCA-2A.

Group	Station	Stations With Means Not Statistically Different	No. of Samples	Arithmetic Mean	Group Slope	Sen Slope (mg/l-year)	Sen Slope p-value
1	**E0**	F0 S10C	58	44.1	m=0	2.17	0.27
	F0	E0 S10C	58	45.2		0.17	0.81
	S10C	E0 F0 S10D	23	50.7		3.16	0.44
	S10D	S10C	23	61.4		-1.68	0.65
2	**E1**	E2 E3 F1 F2	37	34.2	m=0	-2.50	0.78
	E2	E1 E3 F1 F2	33	33.9		-2.88	0.40
	E3	E1 E2 F1 F2	36	34.0		-1.33	0.92
	F1	E1 E2 E3 F2	91	35.4		-1.47	0.41
	F2	E1 E2 E3 F1	113	36.4		-0.44	0.93
3	**E3**	E4	36	34.0	m=0	-1.33	0.92
	E4	E3	35	33.4		-1.63	0.73
	F3	F4 F5	46	33.2	Parallel	3.09	0.03
	F4	F3 F5	35	34.5		2.00	0.14
	F5	F3 F4	37	34.1		5.50	0.05
4	**CA215**	E5 F5 U1 U2 U3	75	35.0	Parallel	6.88	0.02
	E5	CA215 F5 U1 U2 U3	37	31.1		1.00	0.72
	F5	CA215 E5 U1 U2 U3	37	33.9		5.50	0.05
	U1	CA215 E5 F5 U2 U3	42	29.1		3.25	0.02
	U2	CA215 E5 F5 U1 U3	36	34.4		5.50	0.08
	U3	CA215 E5 F5 U1 U2	41	36.4		4.42	0.10
6	**404Z1**	All stations significantly different	34	59.1	Not Parallel	6.00	0.04
	CA28		63	63.5		6.55	0.05
	CA29		71	44.1		12.68	0.13
	FS0.25		10	*0.2*		<Year	NA
	FS1.0		10	*11.3*		<Year	NA
	FS2.0		10	*-36.5*		<Year	NA
	FS3.0		10	*-44.9*		<Year	NA
7	**C4**	S.25 S1 S2 S4	36	58.9	Parallel	6.50	0.02
	S.25	C4 S1 S2 S4	8	65.3		<Year	NA
	S1	C4 S.25 S2 S4	8	60.0		<Year	NA
	S2	C4 S.25 S1 S4	37	56.4		5.00	0.13
	S4	C4 S.25 S1 S2	43	47.6		8.17	0.01
8	**C.25**	C1 C2 N4 S4	44	65.7	Parallel	4.67	0.03
	C1	C.25 C2 N4 S4	43	64.5		6.50	0.00
	C2	C.25 C1 N4 S4	35	60.6		8.88	0.02
	N4	C.25 C1 C2 S4	38	58.4		9.00	0.01
	S4	All stations significantly different	43	45.8		8.17	0.01
9	**N.25**	N1 N2 N4	43	65.2	Parallel	5.67	0.00
	N1	N.25 N2 N4	45	63.8		8.75	0.00
	N2	N.25 N1 N4	34	63.2		8.00	0.04
	N4	N.25 N1 N2	38	58.7		9.00	0.01

Least square mean calculated at mean date

Table 3. Statistical analysis of conductivity at select stations in WCA-2A.

Group	Station	Stations With Means Not Statistically Different	No. of Samples	Arithmetic Mean	Group Slope	Sen Slope (µS/cm-year)	Sen Slope p-value
1	**E0**	F0 S10D	57	1013.3	m=0	38.00	0.10
	F0	E0	58	1022.3		17.00	0.57
	S10C	All stations significantly different	29	765.8		-21.13	0.45
	S10D	E0	67	921.9		8.92	0.72
2	**E1**	F1 F2	37	1033.8	m=0	14.50	1.00
	E2	E3	34	874.1		1.50	1.00
	E3	E2	37	868.8		-22.67	0.67
	F1	E1 F2	94	1202.7		-3.00	1.00
	F2	E1 F1	115	1066.3		-10.42	0.93
3	**E4**	All stations significantly different	36	787.8	m=0	0.50	1.00
	F3		35	1067.8		15.02	0.77
	E3	F4 F5	37	868.8	m=0	-22.67	0.67
	F4	E3 F5	35	886.7		24.00	0.21
	F5	E3 F4	38	928.5		12.50	0.35
4	**CA215**	U2	76	875.2	m=0	26.48	0.26
	U1	All stations significantly different	43	717.2		9.52	1.00
	U2	CA215	37	798.9		24.03	0.73
	E5	U3	38	785.0		-9.40	0.91
	F5	U3	38	928.5		12.50	0.35
	U3	E5 F5	42	851.7		8.75	0.75
6	**404Z1**	All stations significantly different	32	1210.2	Not Parallel	-15.33	1.00
	CA28		64	1206.0		-45.50	0.02
	CA29		73	999.8		40.02	0.22
	FS0.25		10	559.7		<Year	NA
	FS1.0		10	960.4		<Year	NA
	FS2.0		10	581.6		<Year	NA
	FS3.0		10	404.2		<Year	NA
7	**S.25**	S1	8	1213.6	m=0	<Year	NA
	S1	S.25	8	1156.8		<Year	NA
	C4	S2 S4	33	1051.7		46.25	0.30
	S2	C4 S4	35	1071.9		-20.20	0.73
	S4	C4 S2	43	1059.1		-14.25	0.76
8	**C.25**	All stations significantly different	43	1171.6	m=0	21.00	0.36
	S4		43	1059.1		-14.25	0.76
	C1	C2 N4	41	1157.9	Parallel	53.67	0.01
	C2	C1 N4	33	1105.3		74.50	0.08
	N4	C1 C2	37	1099.8		58.25	0.04
9	**N.25**	N1 N2 N4	43	1178.4	Parallel	40.50	0.22
	N1	N.25 N2 N4	44	1170.6		46.75	0.01
	N2	N.25 N1 N4	34	1117.8		54.50	0.01
	N4	N.25 N1 N2	37	1099.5		58.25	0.04