Appendix A. Data Sources

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Table 18. Upper Snake-Rock Subbasin Data Sources

Name	Source	Description	Years	Constituents
Mid Snake Statistics Files	IDEQ	Includes raw data from 7 water quality and 4 flow stations on the mainstem and 30 water quality stations on tributaries. In addition, the mainstem data are summarized by various time periods, including calendar years, decades (1990s and 2000s), months, seasons, and water years.	1989–2010 (depends on station; tributary data are for 2007–2008)	Flow, TSS, Lab NTU, TP, DOP, TKN, NH3, NOX, E COLI, F COLI, CHLORO, PHEOP, TEM, Field NTU, pH, SC, TDS, DO, % DO SAT (Not all constituents were sampled at each station location)
Irrigation Return Flow Monitoring	USDA-ARS Kimberly	Water quality and flow volume records for 26 drains for irrigation return flow monitoring	2005–2008	Flow, TKN, TP, Dissolved Aluminum, Dissolved Ca, Dissolved Chloride, Diss. Iron, Diss. Potassium, Diss. Magnesium, Diss. Manganese, Diss. Sodium, Diss. Ammonia, Nitrate, Diss. P, Diss. Sulfur, Diss. Zinc, Specific Conductivity, pH, and Suspended Sediment
Twin Falls Irrigation Drain Monitoring	Twin Falls Canal Co.	Water quality and flow data (for some dates and stations) for Twin Falls Canal Co. irrigation drains.	1990–2011	TSS, TP, air temp, water temp, flow, stage, turbidity, electrical conductivity, dissolved oxygen, pH, Total Nonfilterable Residue, Total Ammonia, TKN, N-dissolved and oxidized, TP, Orthophosphate Dissolved (May not be available for all years or locations)
North Side Canal Irrigation Drain Monitoring	North Side Canal Company	Water quality for North Side Canal Co. irrigation drains.	2002–2011	TP, OP, TSS
Macrophyte	Idaho Power	Aquatic vegetation removal (in number of truckloads) and TP equivalency from Upper Salmon A, Upper Salmon B, Lower Salmon, and Bliss dams	1991–2011	NA
Water Quality	Idaho Power	Water quality data collected at river mile 546. Spreadsheet includes raw data, paired data, time series plots, and daily mean flow at King Hill.	1991–2011	Ammonia, Chla, DO, Nitrate, NitrogenTotK, OrgCTot, OrgCTotDis, OrthoPDis, pH, Ptot, SpecCond, SusSolTot, Temperature, Turbidity, VolSusSol

Name	Source	Description	Years	Constituents
Water Quality	USGS - NWIS	Nutrient and sediment monitoring data throughout the Upper Snake-Rock Subbasin	2003–2012 (depends on station)	TN, Suspended Sediment
Irrigation Return Flow	Idaho Department of Water Resources	Gage height records and calculated daily flow (cfs) and flow volume (acre-ft) for return flow drains to the Snake River.	2002–2010 (depends on drain)	Return flow data (not WQ data)
ESPAM	Idaho Department of Water Resources	Estimation of average flow contributions due to springs and underflow ("baseflow") from 1980 to roughly 2009.	Average of data from 1980 to 2008 or 2009 depending on reach segment	Flow (cfs)

Appendix B. Additional Flow Comparisons

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Table 19. Comparison of TMDL Flow Assumptions (1997,1999, 2000, and 2005) to Flow Summary Statistics (2000–2009)

Study Segment[1]	TMDL Flow Assumptions				Mean Annual Q 2000-2009, cfs[6]	30Q10 POR cfs[7]	7Q10 POR cfs	10th Percentile POR cfs
	1997 TMDL Q, cfs[2]	1999 Draft TMDL Q, cfs[3]	2000 TMDL Q, cfs[4]	2005 TMDL Q, cfs[5]				
MD to PF	NA	425 to 1,302 = 877	3,860 to 4,737 = 877	3,860 to 4,737 = 877	1,116 to 1,665 = 549	2 to 562 = 560	1 to 530 = 529	13 to 710 = 697
PF to CS	NA	1,302 to 2,075 = 773	4,737 to 5,498 = 761	4,737 to 5,498 = 761	1,665 to 2,556 = 891	562 to 1,393 = 831	530 to 1,311 = 781	710 to 1,693 = 983
CS to BC	NA	2,075 to 3,817 = 1,742	5,498 to 7,212 = 1,714	5,498 to 7,212 = 1,714	2,556 to 3,959 = 1,403	1,393 to 2,776 = 1,383	1,311 to 2,678 = 1,367	1,693 to 3,179 = 1,486
BC to GB	NA	3,817 to 5,709 = 1,892	7,212 to 9,113 = 1,901	7,212 to 9,113 = 1,901	3,959 to 4,701 = 742	2,776 to 3,516 = 740	2,678 to 3,417 739	3,179 to 3,958 = 779
GB to SB	NA	5,709 to 7,545 = 1,836	9,113 to 11,108 = 1,995	9,113 to11,108 = 1,995	4,701 to 6,461 = 1,760	3,516 to 5,173 = 1,657	3,417 to 5,043 = 1,626	3,958 to 5,722 = 1,764
SB to KH	NA	7,545 to 7,966 = 421	11,108 to 11,398 = 290	11,108 to 11,398 = 290	6,461 to 7,689 = 1,228	5,173 to 6,106 = 933	5,043 to 5,892 = 849	5,722 to 6,761 = 1,039

[1]MD = Milner Dam; PF = Pillar Falls; CS = Crystal Springs; BC = Box Canyon; GB = Gridley Bridge; SB = Shoestring Bridge; KH = King Hill; Q = flow; POR = period of record.

[2]NA = Not applicable; The segregation of the TMDL reach segments did not occur until the 2000 TMDL. The 1997 TMDL did not incorporate these six reach segments. However, Table 7 (page 14) of the TMDL indicates flows at the USGS gage stations as: MD = 3,430 cfs; near Kimberly = 3,800 cfs; near Buhl = 5,450 cfs; near Hagerman = 9,280 cfs; and KH = 11,020 cfs.

[3]The values are based on net flow (output – input) as found in the 1999 TMDL (pages 357–363). This is referred to as the "Difference" as net flow for the segment (output – input).

[4]2000 TMDL Executive Summary, TSS TP Allocation Summary for Segments 1–6. This summary was developed by EPA and IDEQ and was the basis for the 2000 TMDL based on the 1999 Draft TMDL.

[5]The flows for these reaches were estimated as average (or mean) flows (page 37, Section 10.1, 2005 TMDL) at the compliance points for each of the six segments. Each segment has two compliance points, an input and an output.

[6]Mean annual flow for 2000–2009 for USGS gage stations: MD = 1,116 cfs; near Kimberly = 1,389 cfs; near Buhl = 2,799 cfs; near Hagerman = 6,046 cfs; and KH = 7,712 cfs.

[7]Percent of reach for USGS gages is the following: MD = 5/1/1909 to 9/30/2010; near Kimberly = 10/1/1923 to 9/30/2010; near Buhl = 12/12/1946 to 1/4/2012; near Hagerman = 10/1/1937 to 9/30/2011; and KH = 6/1/1909 to 1/9/2012.

Milner Dam

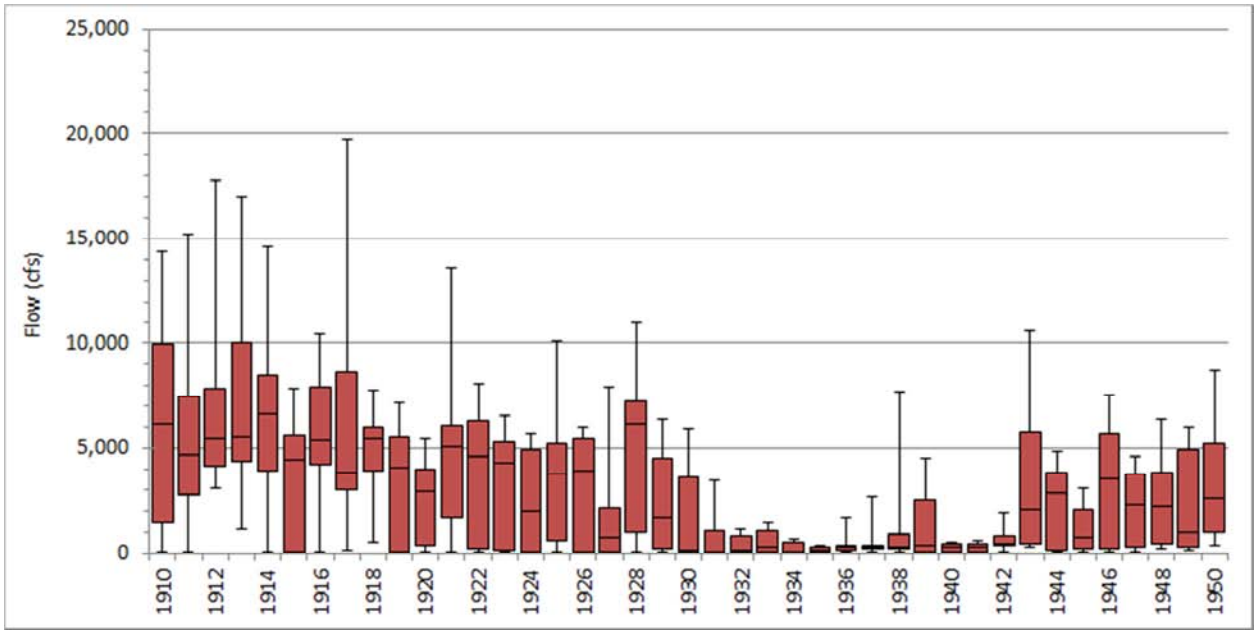

Figure 37. Milner Dam daily flows, 1910–1950.

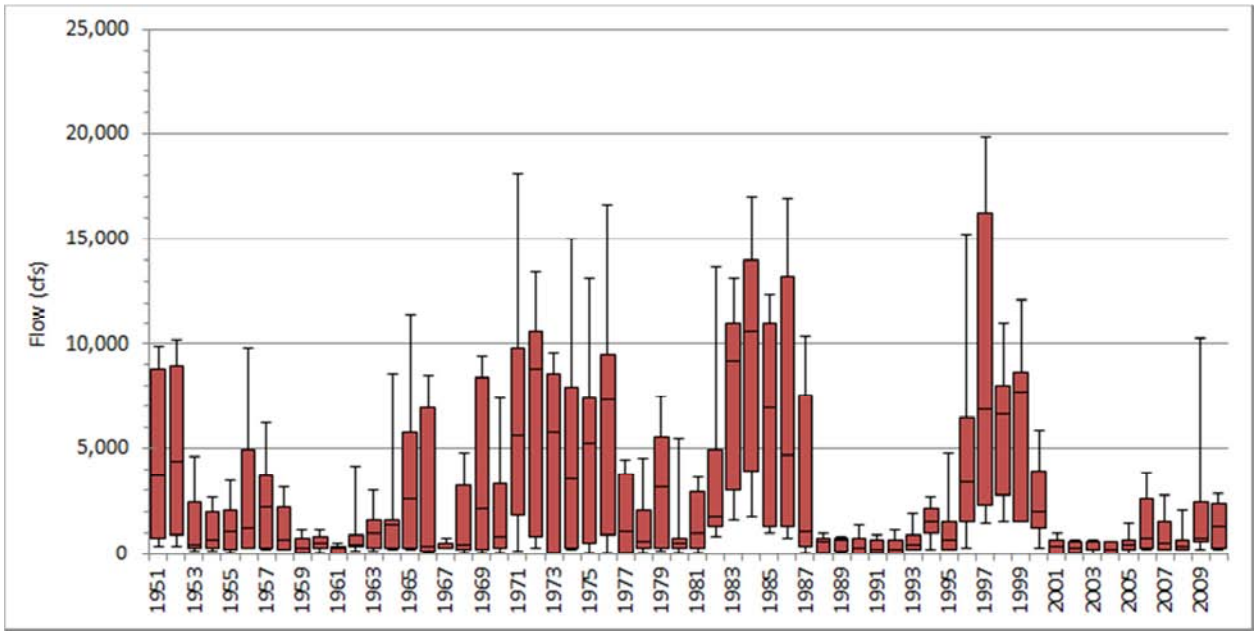

Figure 38. Milner Dam daily flows, 1951–2010.

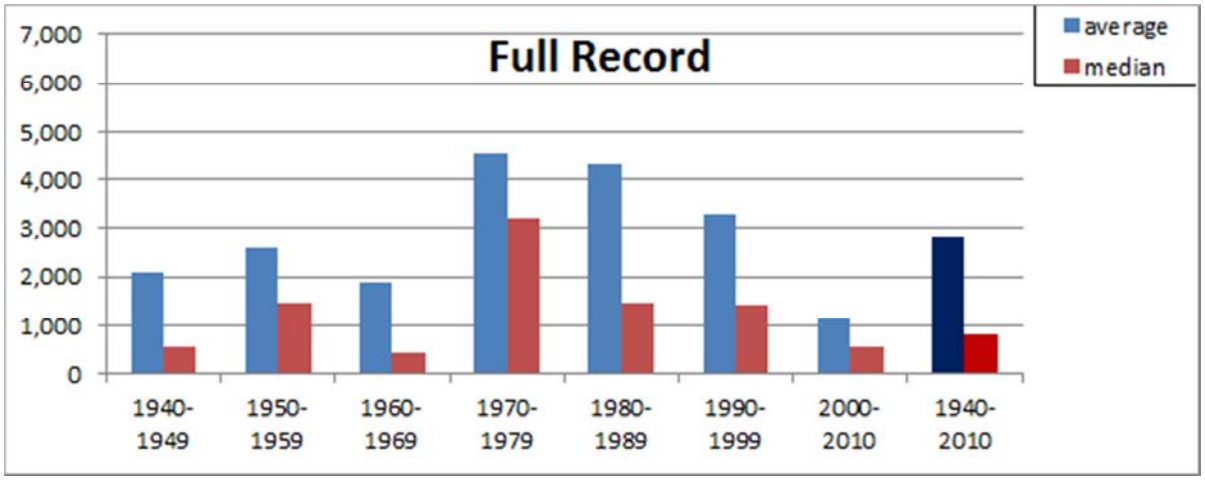

Figure 39. Milner Dam average and median daily flows by decade.

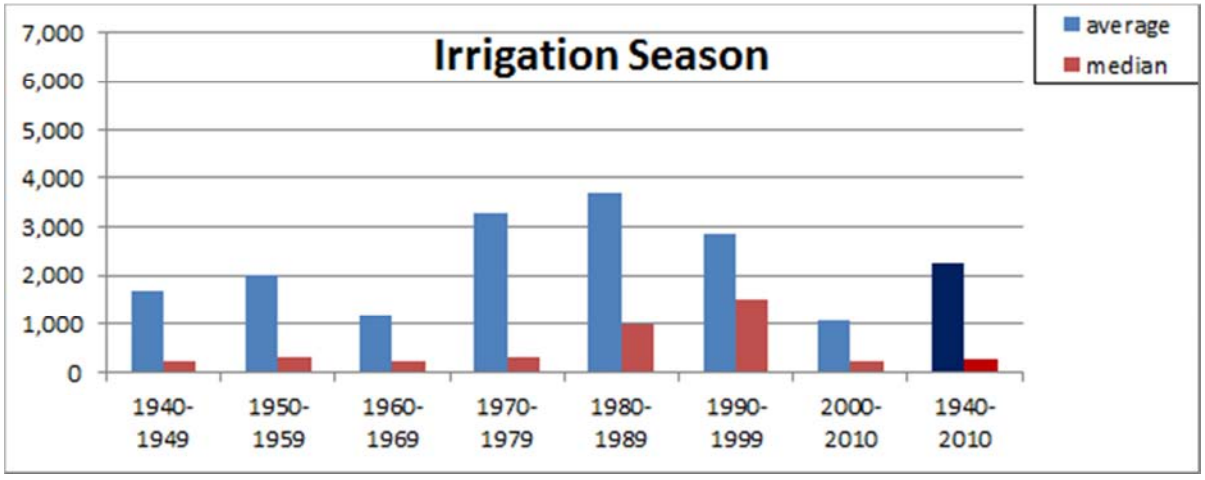

Figure 40. Milner Dam average and median daily flows by decade during the irrigation season.

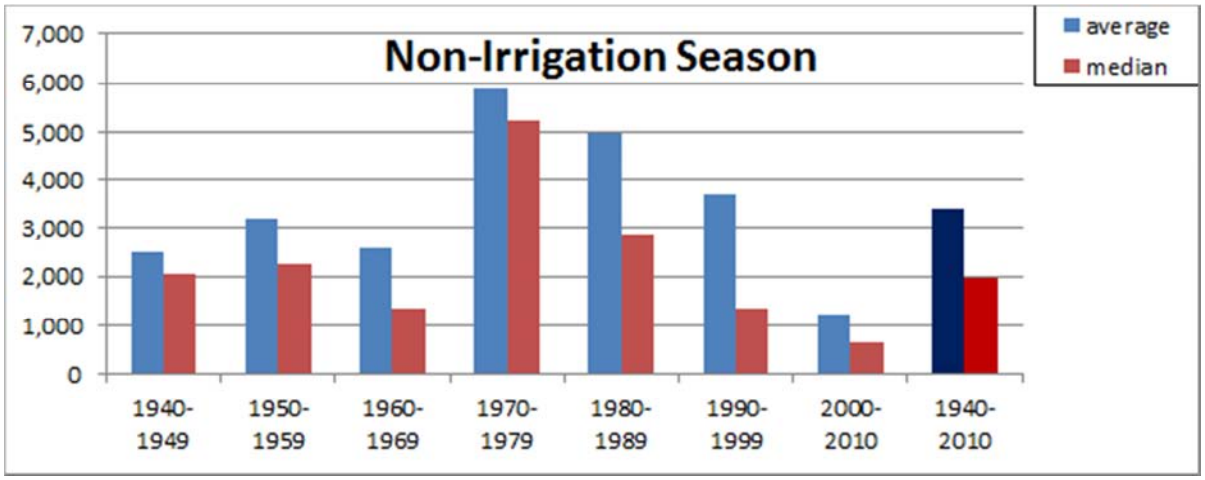

Figure 41. Milner Dam average and median daily flows by decade during the non-irrigation season.

Kimberly

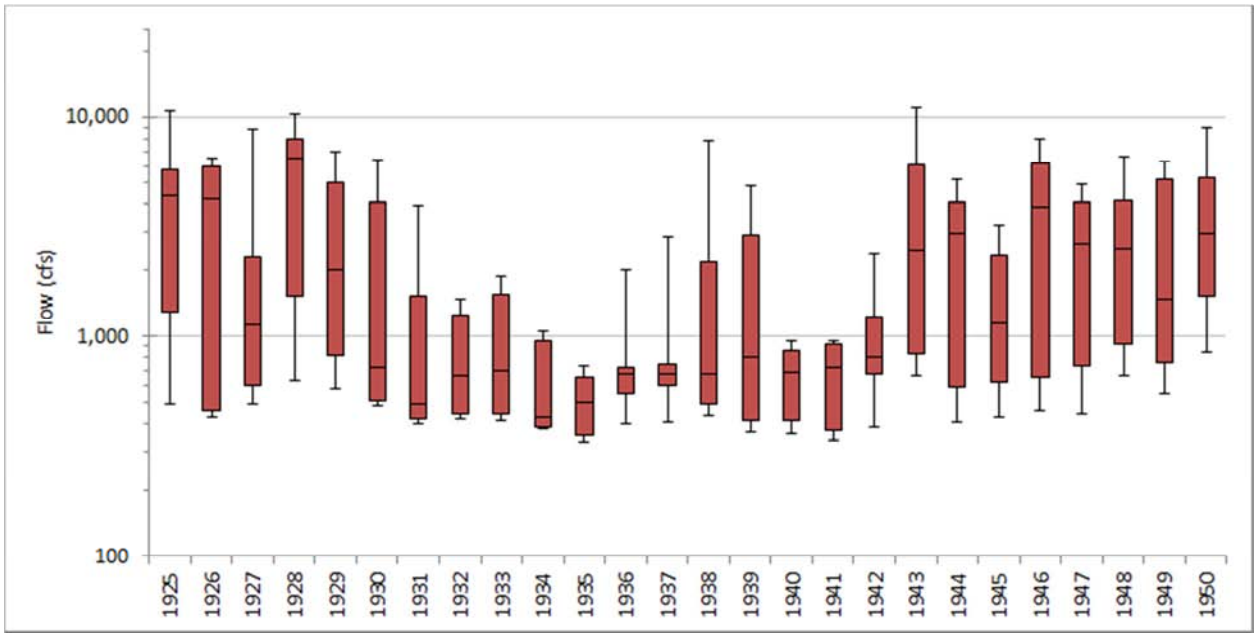

Figure 42. Kimberly daily flows, 1925–1950.

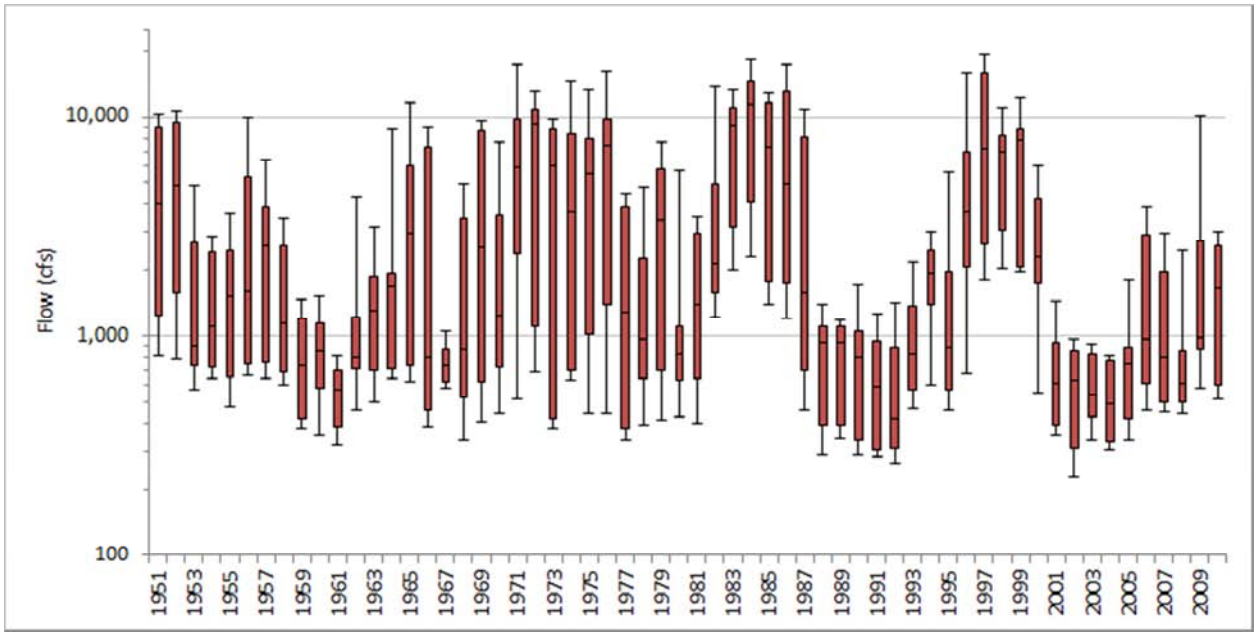

Figure 43. Kimberly daily flows, 1951–2010.

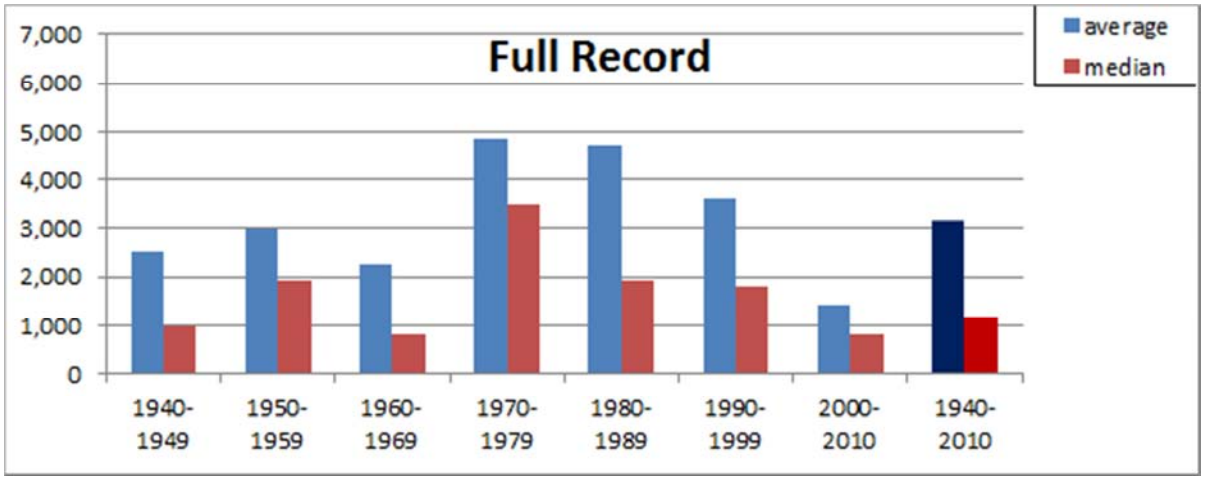

Figure 44. Kimberly average and median daily flows by decade.

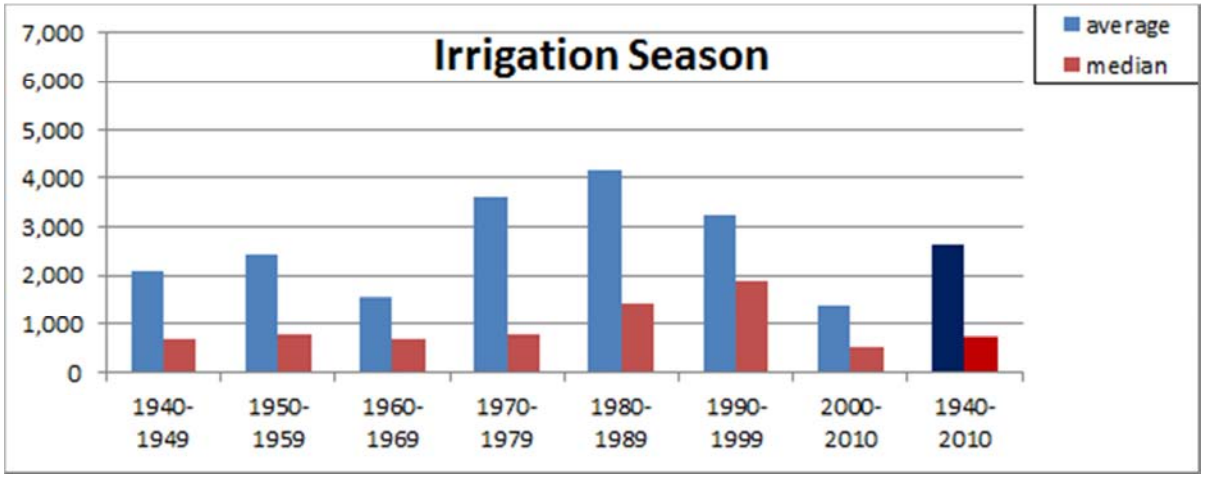

Figure 45. Kimberly average and median daily flows by decade during the irrigation season.

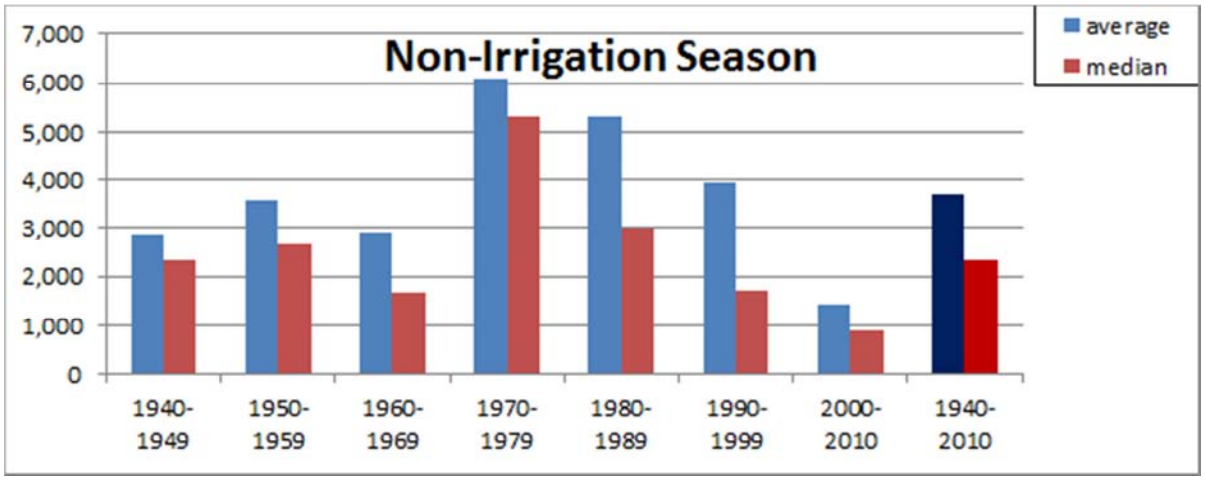

Figure 46. Kimberly average and median daily flows by decade during the non-irrigation season.

Buhl

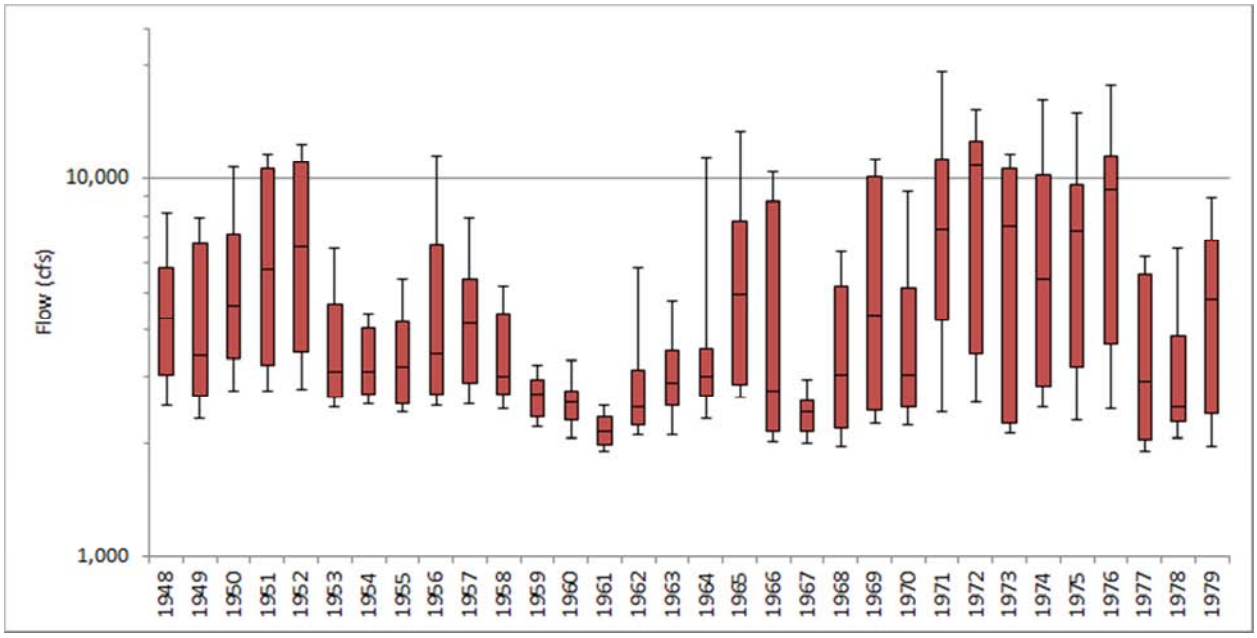

Figure 47. Buhl daily flows, 1948–1979.

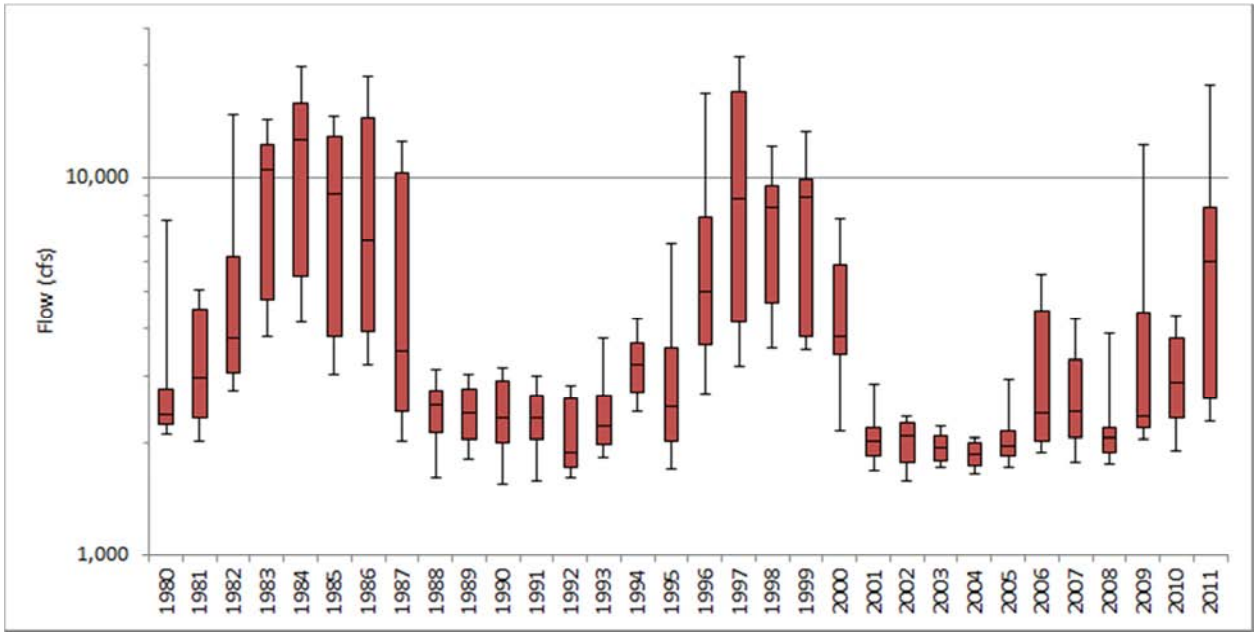

Figure 48. Buhl daily flows, 1980–2011.

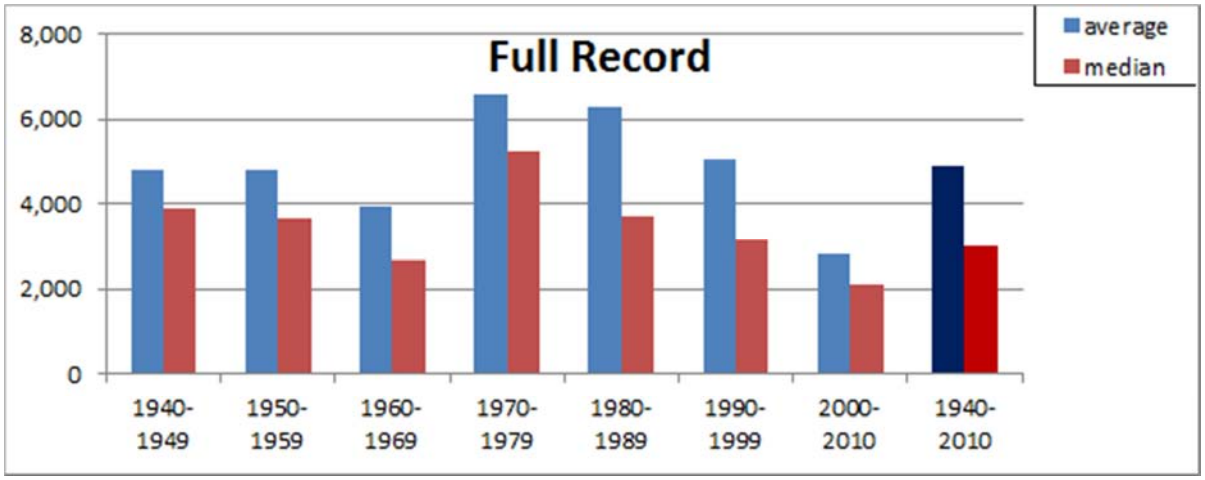

Figure 49. Buhl average and median daily flows by decade.

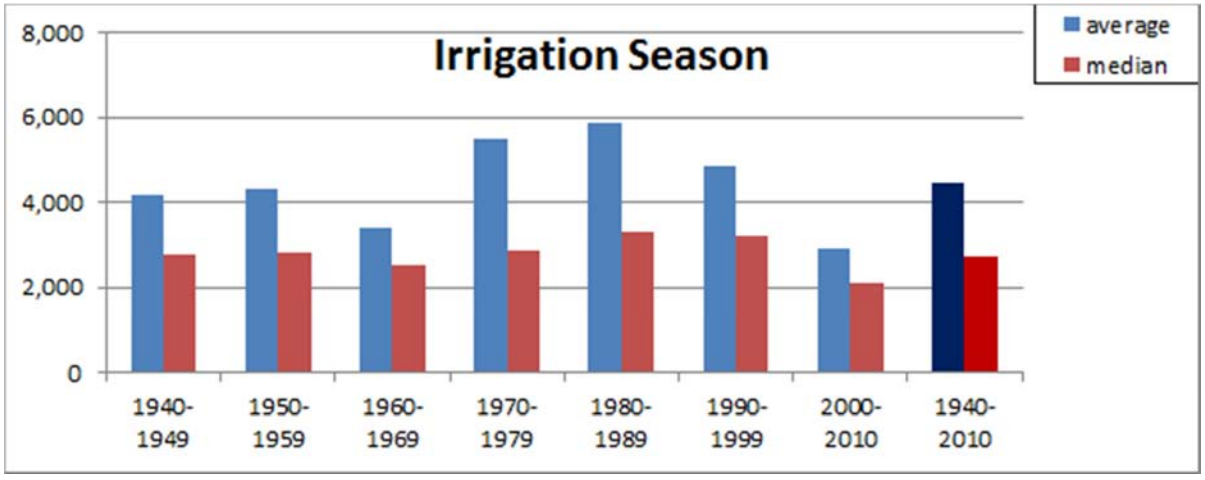

Figure 50. Buhl average and median daily flows by decade during the irrigation season.

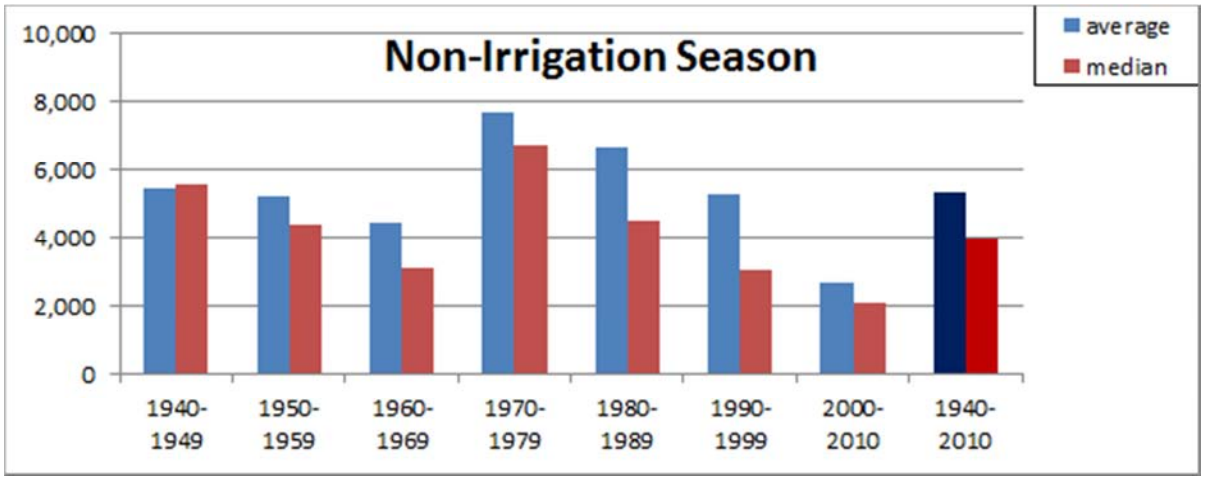

Figure 51. Buhl average and median daily flows by decade during the non-irrigation season.

King Hill

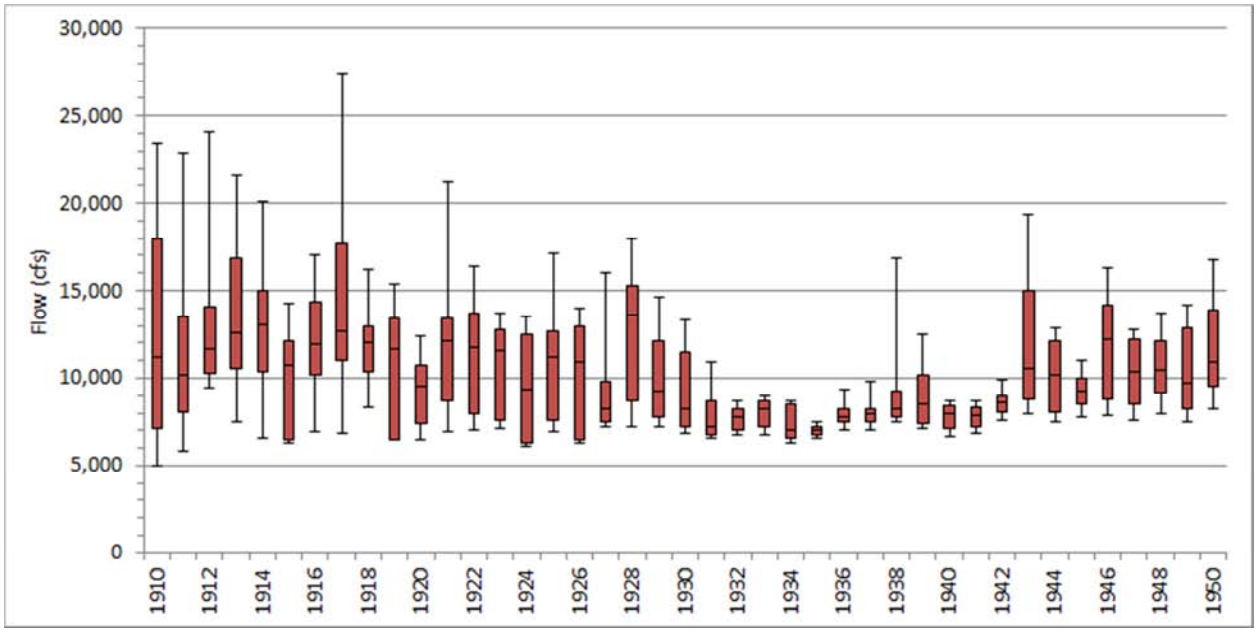

Figure 52. King Hill daily flows, 1910–1950.

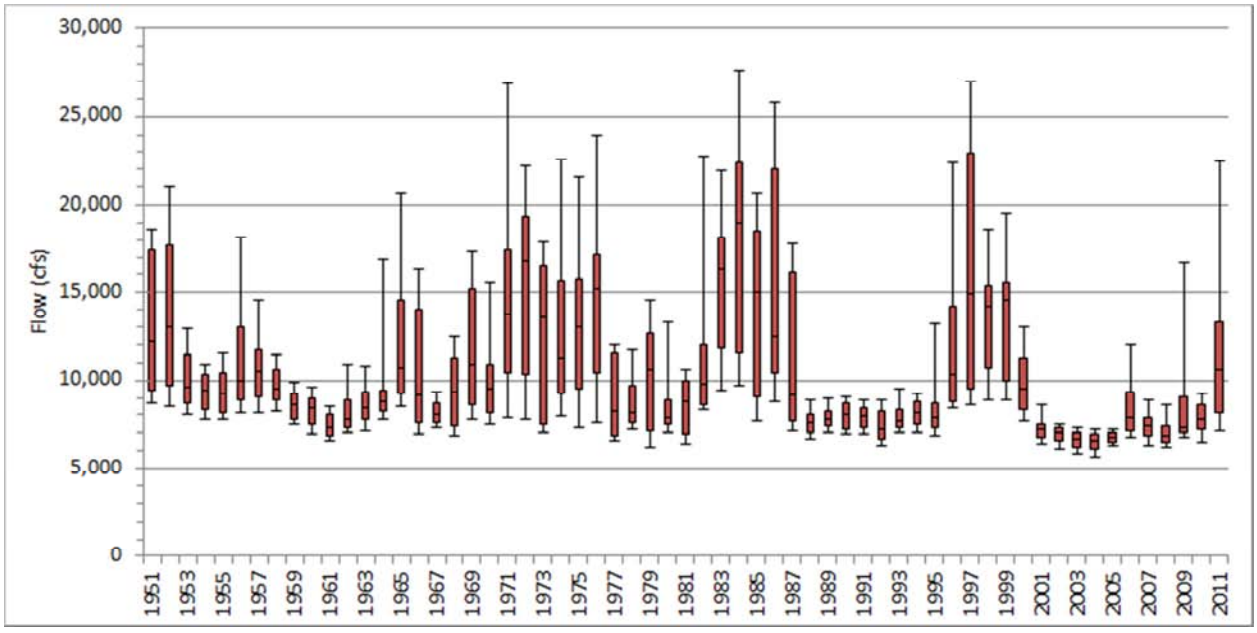

Figure 53. King Hill daily flows, 1951–2011.

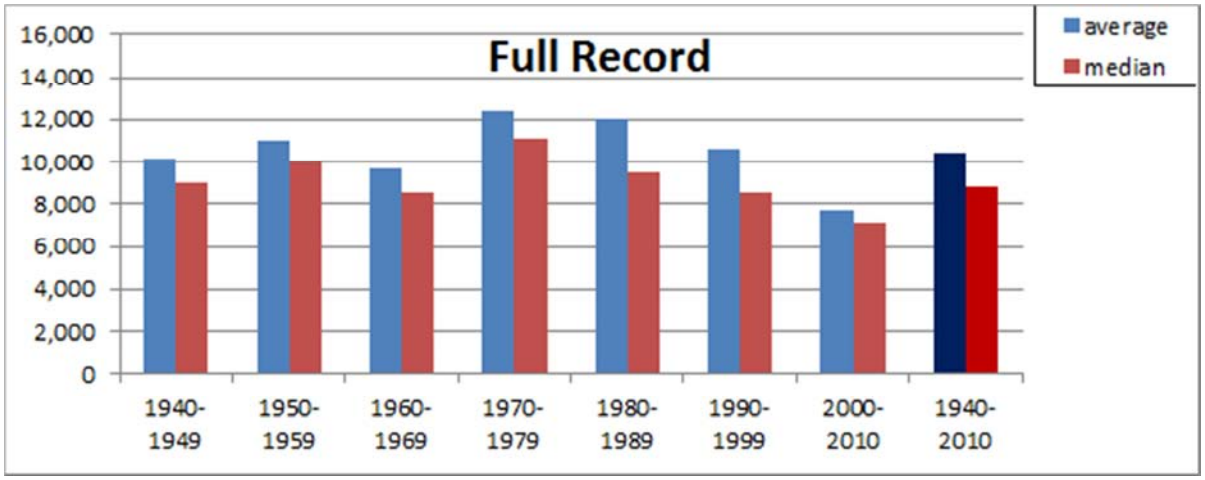

Figure 54. King Hill average and median daily flows by decade.

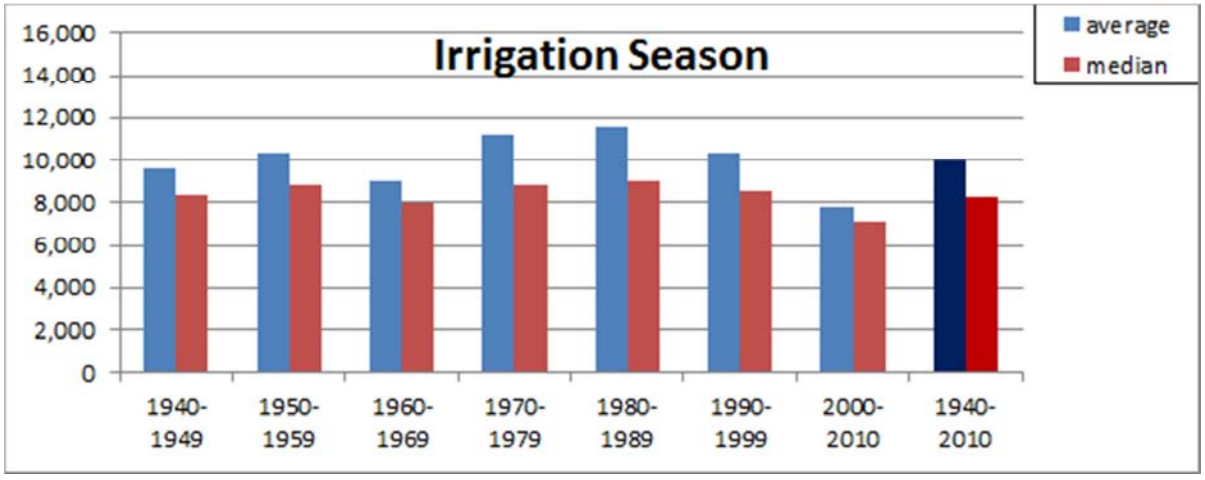

Figure 55. King Hill average and median daily flows by decade during the irrigation season.

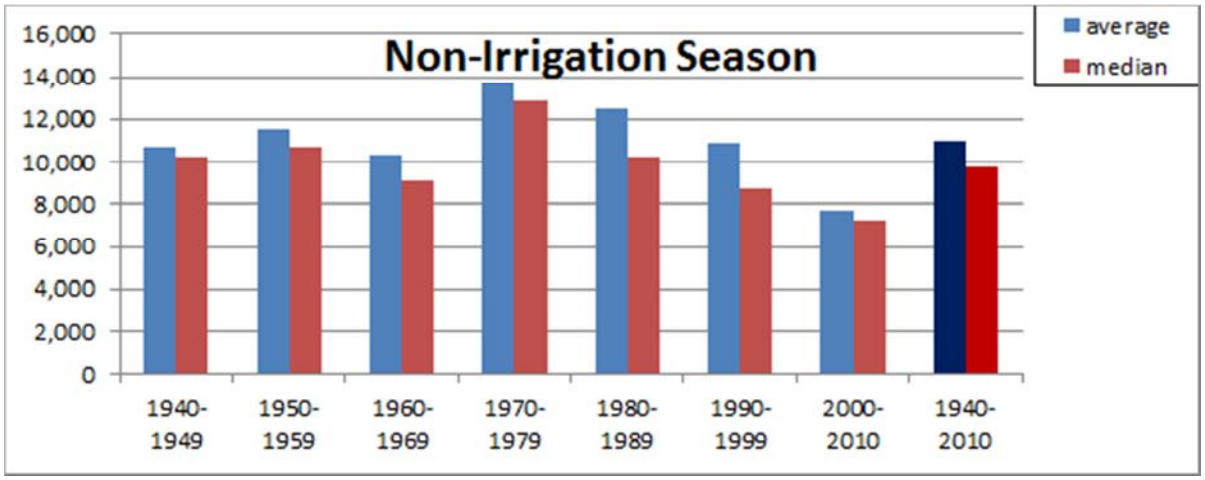

Figure 56. King Hill average and median daily flows by decade during the non-irrigation season.

Appendix C. Water Quality—Seasonal Assessment

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Seasonal definitions for Appendix C figures:

- Winter – December 1 to February 28
- Spring – March 1 to May 31
- Summer – June 1 to August 31
- Fall – September 1 to November 30

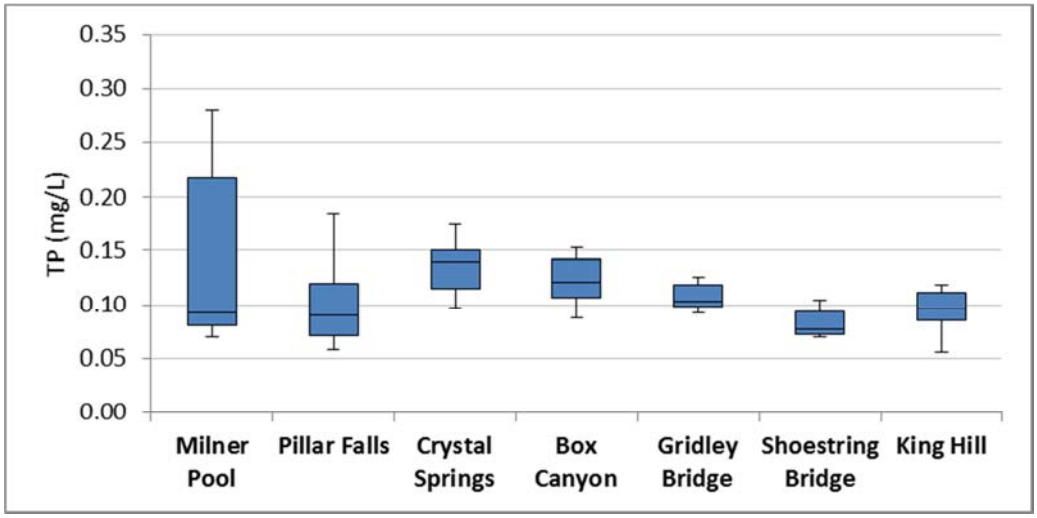

Figure 57. Winter TP concentration along mainstem for water years 1990–1999. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

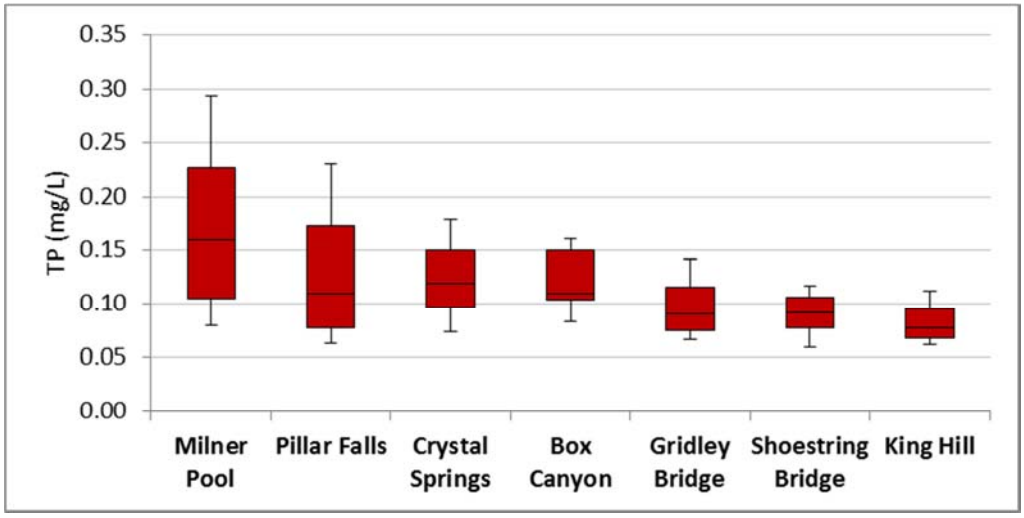

Figure 58. Winter TP concentration along mainstem for water years 2000–2009. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

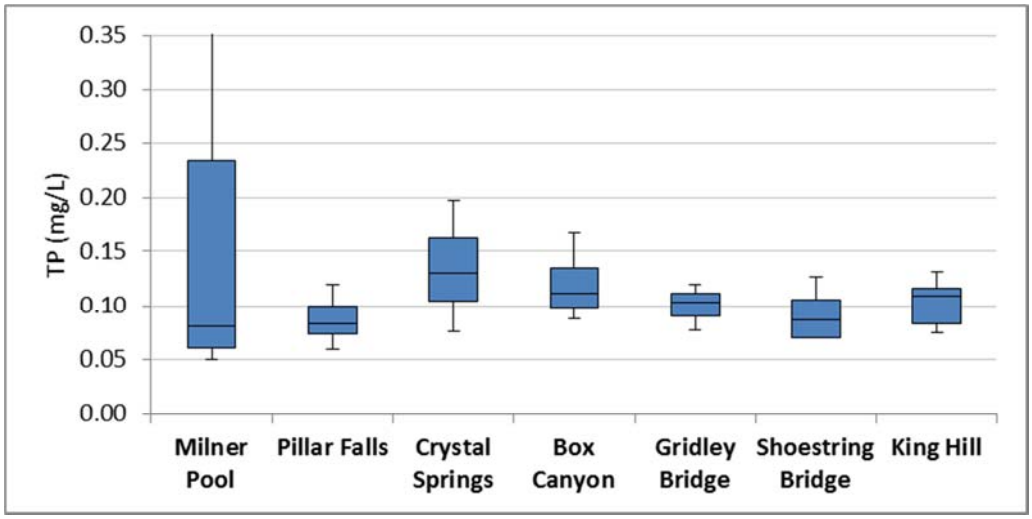

Figure 59. Spring TP concentration along mainstem for water years 1990–1999. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

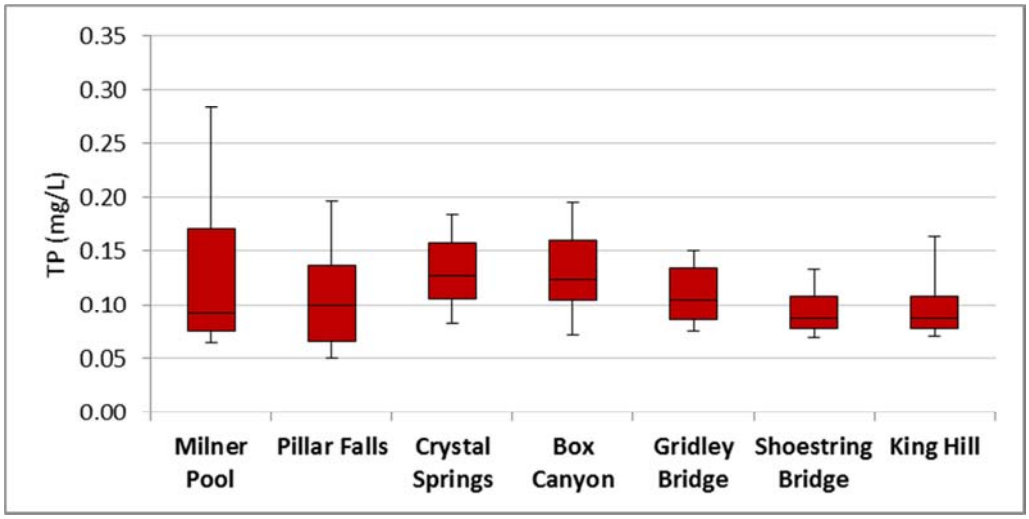

Figure 60. Spring TP concentration along mainstem for water years 2000–2009. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

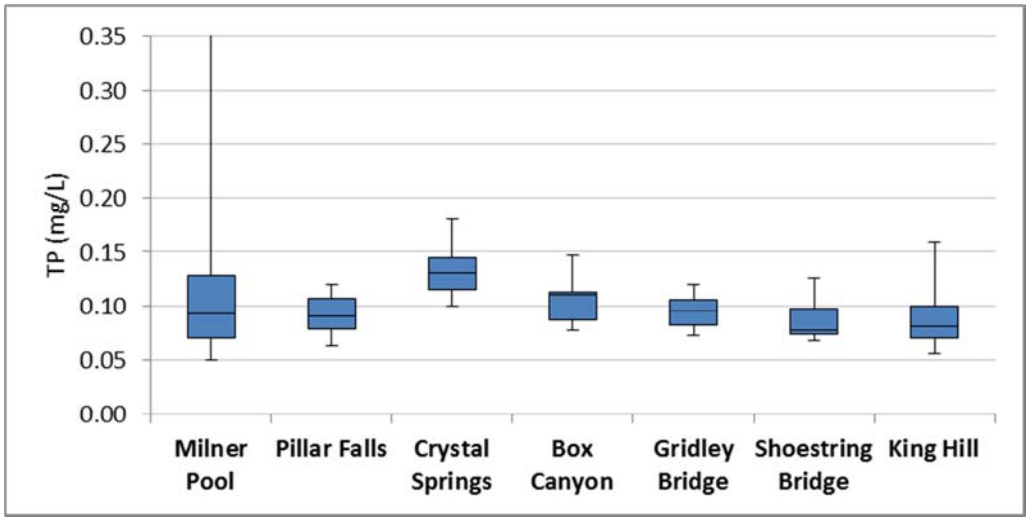

Figure 61. Summer TP concentration along mainstem for water years 1990–1999. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

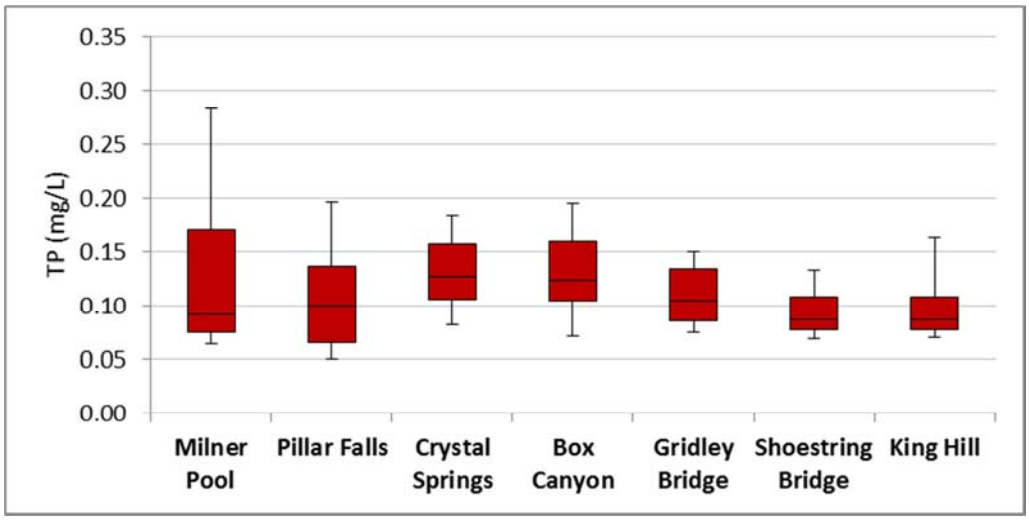

Figure 62. Summer TP concentration along mainstem for water years 2000–2009. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

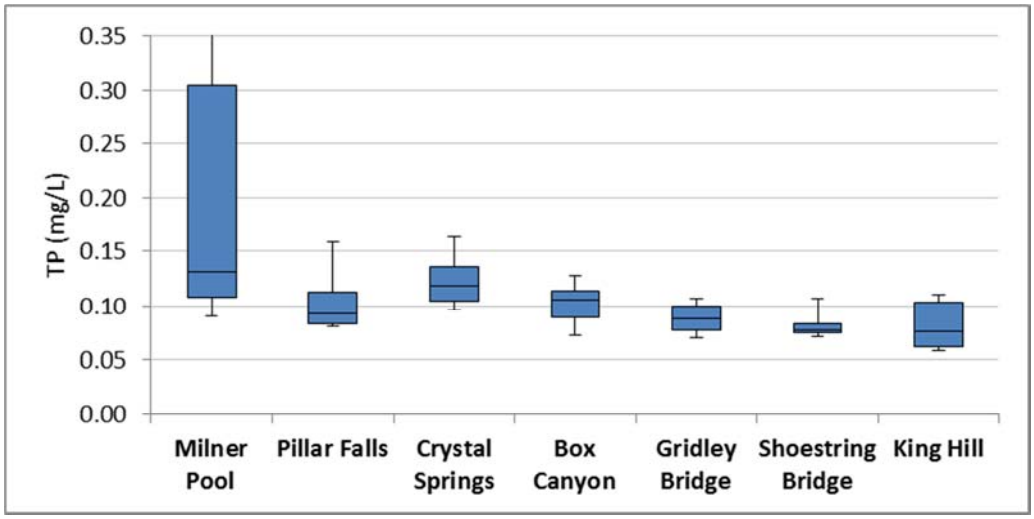

Figure 63. Fall TP concentration along mainstem for water years 1990–1999. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

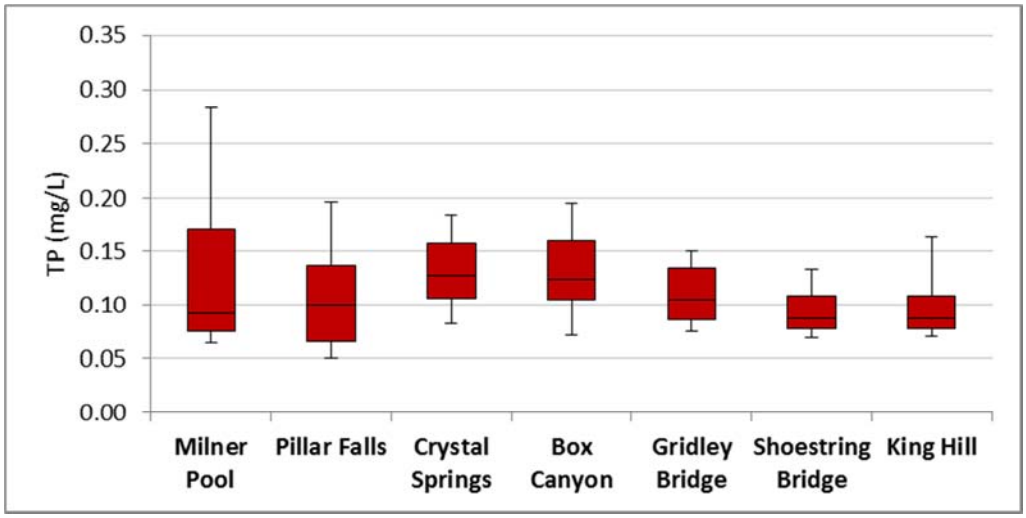

Figure 64. Fall TP concentration along mainstem for water years 2000–2009. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

Appendix D. Water Quality—Seasonal and Decadal Assessment

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Seasonal definitions for Appendix D figures:

- Winter – December 1 to February 28
- Spring – March 1 to May 31
- Summer – June 1 to August 31
- Fall – September 1 to November 30

Decadal definitions for Appendix D figures:

- 1990s – Water years 1990 to 1999
- 2000s – Water years 2000 to 2009

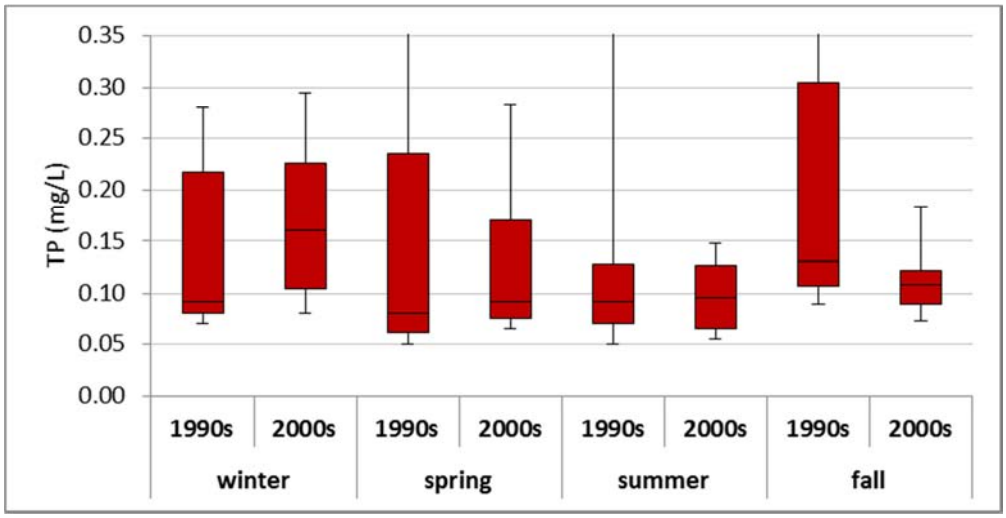

Figure 65. Milner Pool decadal TP concentration comparison between seasons. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

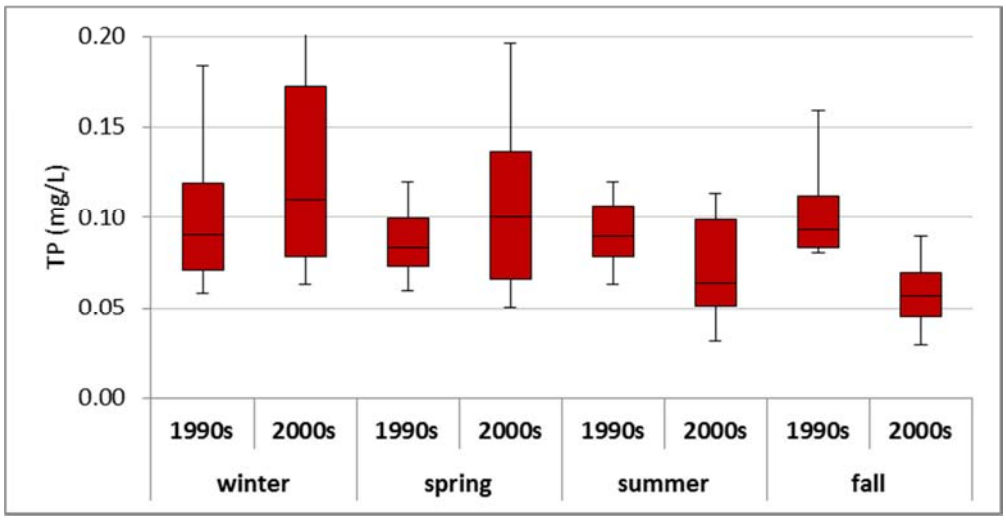

Figure 66. Pillar Falls decadal TP concentration comparison between seasons. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

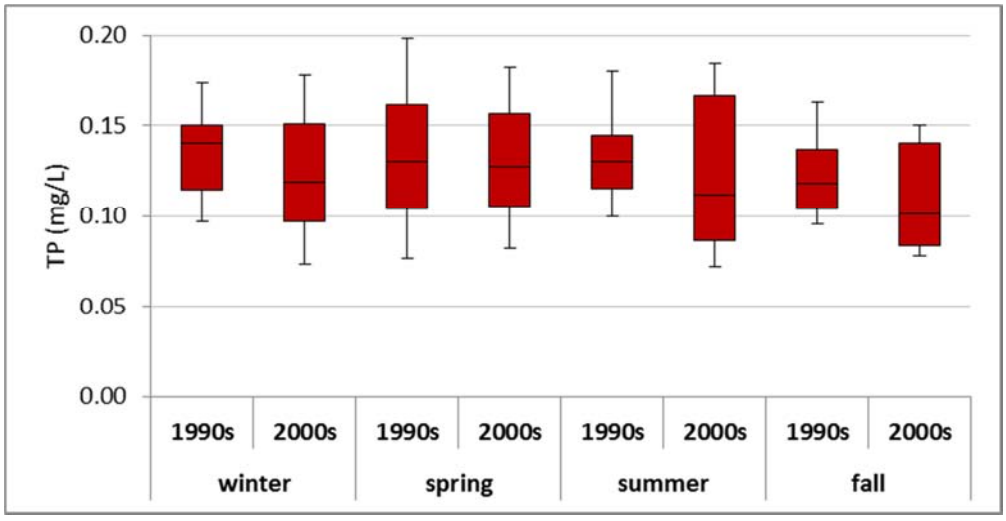

Figure 67. Crystal Springs decadal TP concentration comparison between seasons. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

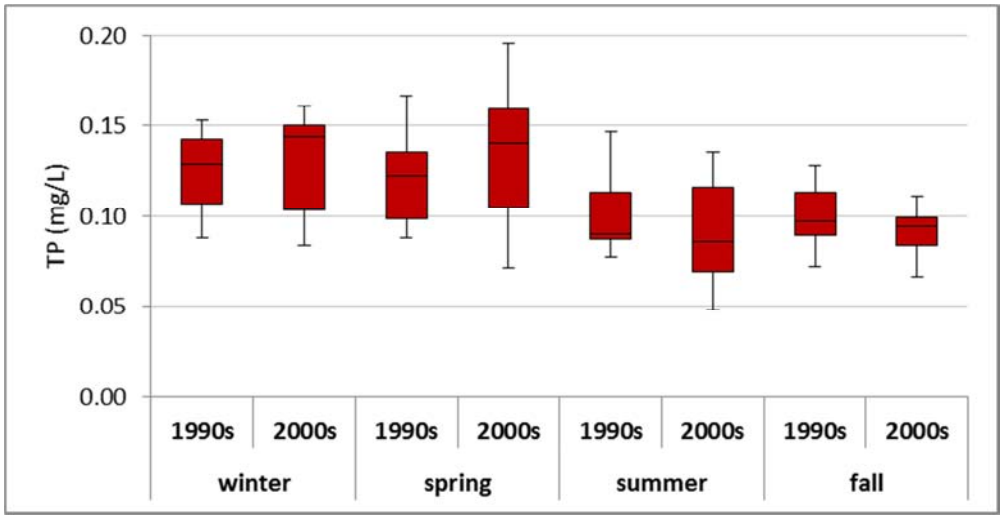

Figure 68. Box Canyon decadal TP concentration comparison between seasons. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

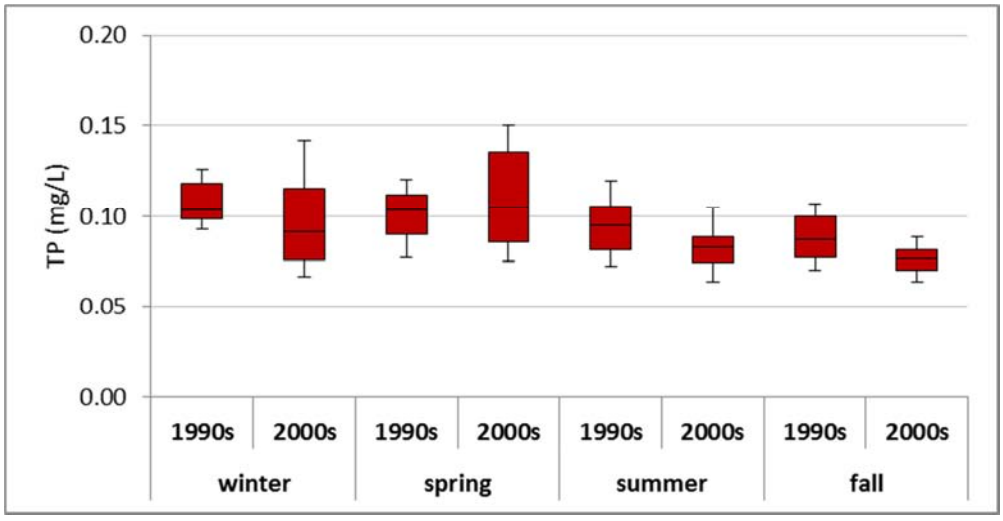

Figure 69. Gridley Bridge decadal TP concentration comparison between seasons. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

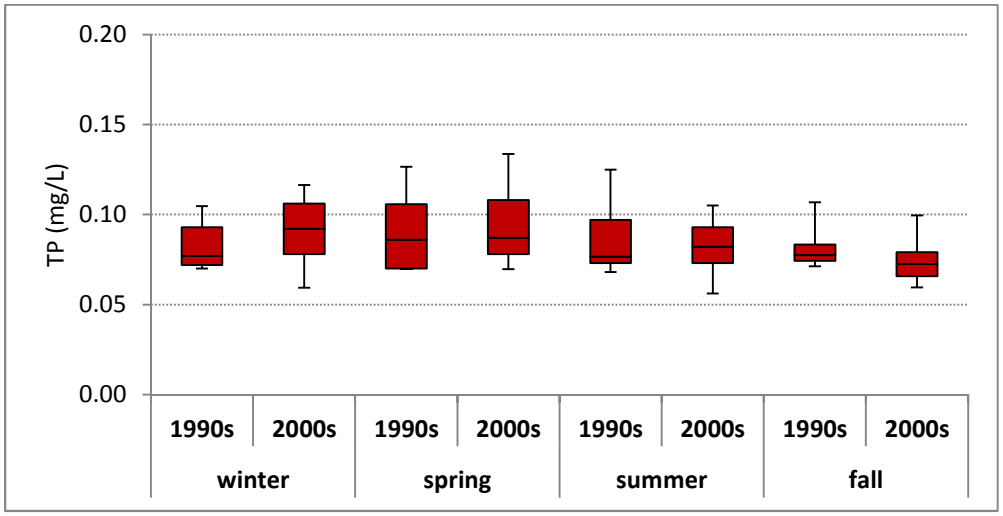

Figure 70. Shoestring Bridge decadal TP concentration comparison between seasons. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

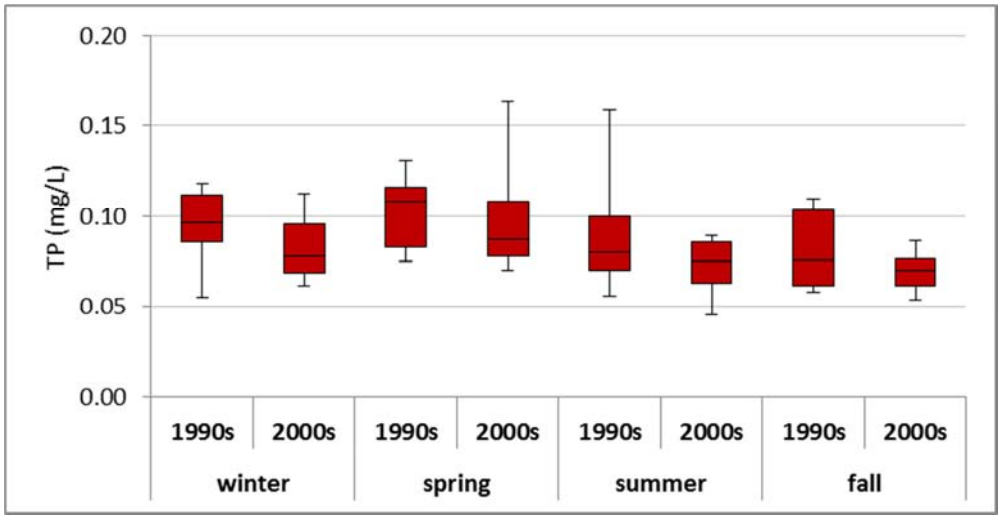

Figure 71. King Hill Bridge decadal TP concentration comparison between seasons. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

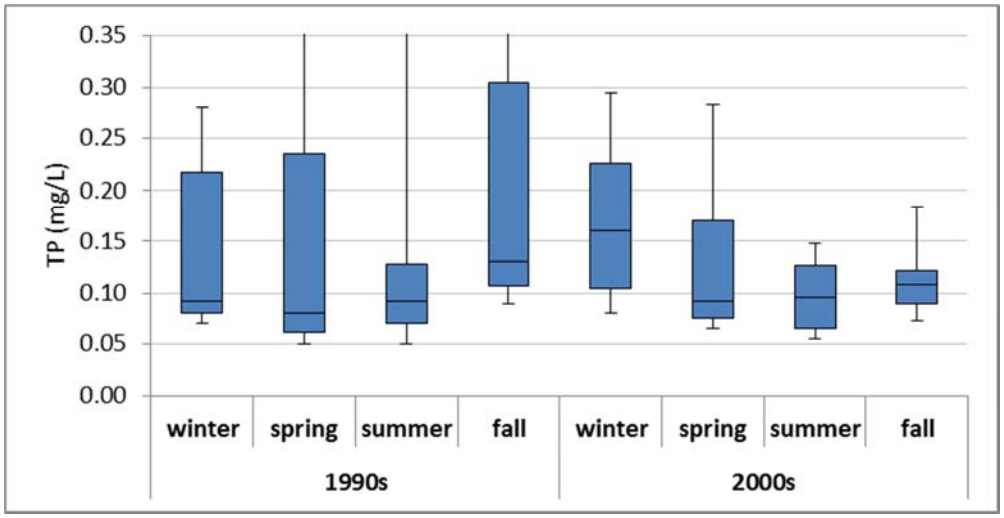

Figure 72. Milner Pool seasonal TP concentration comparison between 1990s and 2000s. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

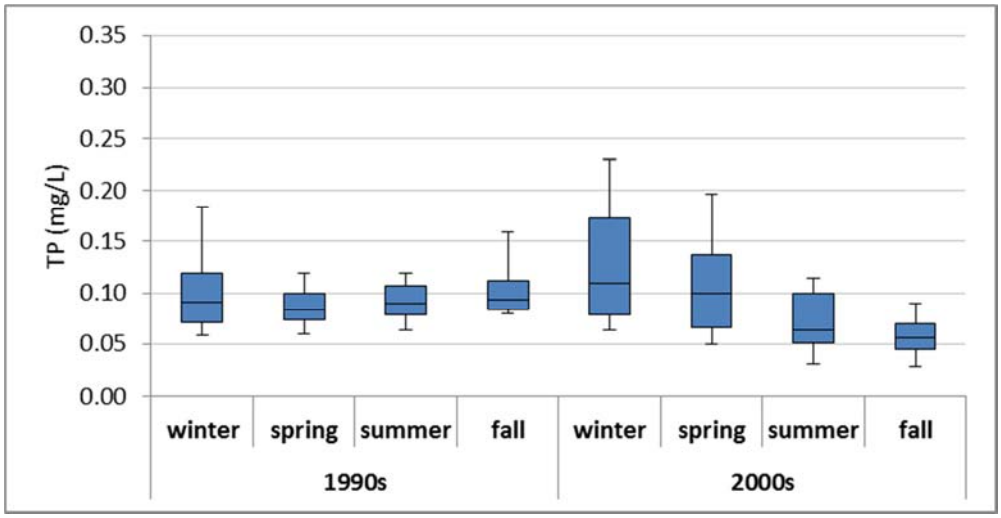

Figure 73. Pillar Falls seasonal TP concentration comparison between 1990s and 2000s. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

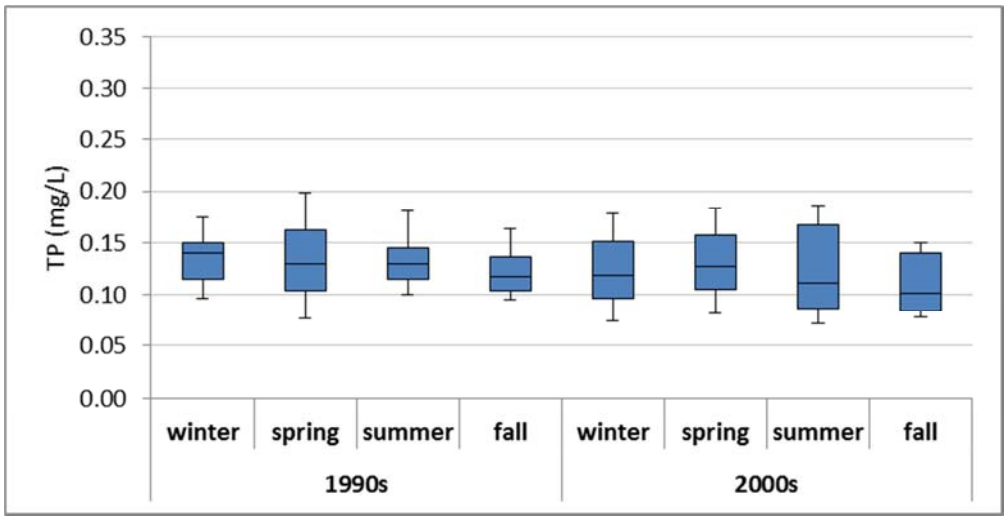

Figure 74. Crystal Springs seasonal TP concentration comparison between 1990s and 2000s. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

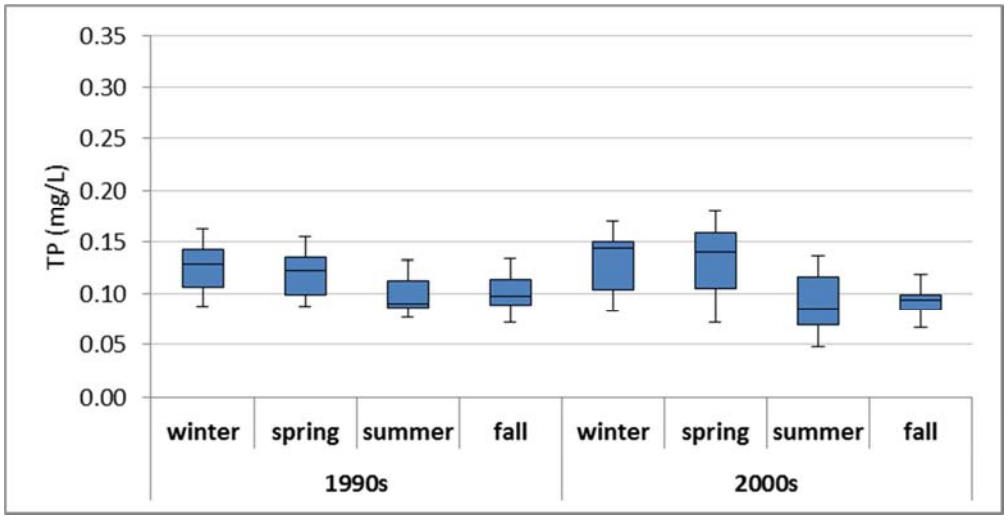

Figure 75. Box Canyon seasonal TP concentration comparison between 1990s and 2000s. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

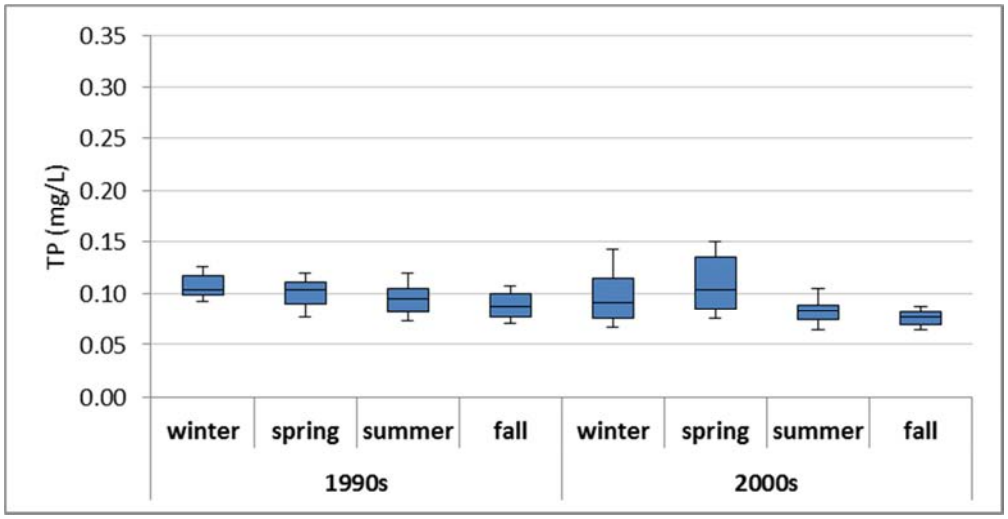

Figure 76. Gridley Bridge seasonal TP concentration comparison between 1990s and 2000s. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

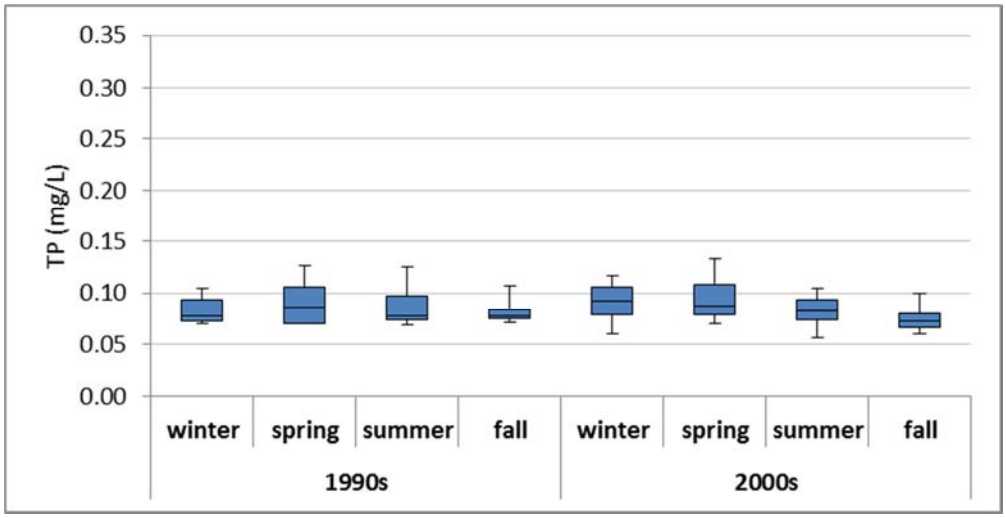

Figure 77. Shoestring Bridge seasonal TP concentration comparison between 1990s and 2000s. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

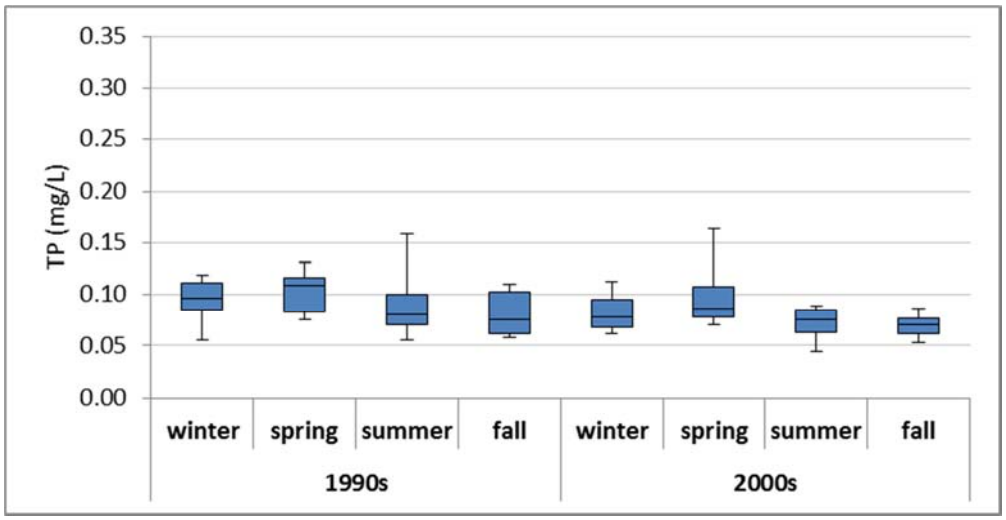

Figure 78. King Hill Bridge seasonal TP concentration comparison between 1990s and 2000s. (Boxes represent 25th, 50th, and 75th percentiles; whiskers represent 10th and 90th percentiles.)

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Appendix E. Water Quality—Summary Statistics

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Table 20. Water Quality Summary Statistics for the Mainstem of the Middle Snake River

	IDEQ and USGS														Idaho Power		TFCC[4]	NSCC[4]
	Milner Pool		Pillar Falls		Crystal Springs		Box Canyon		Gridley Bridge		Shoestring Bridge		King Hill		King Hill		Milner Dam	Milner Dam
	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	>2000	>2000
TP (mg/L)																		
N	252	131	95	126	218	125	89	125	122	126	152	125	181	244	99	305	517	10
Min	0.03	0.03	0.05	0.01	0.05	0.05	0.03	0.04	0.06	0.04	0.06	0.03	0.02	0.01	0.05	0.05	0.02	0.04
Mean	0.15	0.13	0.10	0.10	0.14	0.12	0.11	0.11	0.10	0.09	0.09	0.09	0.09	0.08	0.10	0.09	0.11	0.08
Max	0.90	0.41	0.26	0.91	0.29	0.58	0.20	0.23	0.21	0.24	0.26	0.62	0.34	0.41	0.36	0.25	0.44	0.12
Median	0.09	0.11	0.09	0.07	0.14	0.11	0.11	0.10	0.10	0.09	0.08	0.08	0.08	0.07	0.09	0.08	0.09	0.09
DOP (mg/L)																		
N	198	119	95	123	218	124	89	125	122	125	152	125	70	125	98	305	518	10
Min	0.003	0.003	0.003	0.003	0.005	0.010	0.007	0.005	0.006	0.003	0.009	0.003	0.008	0.003	0.003	0.003	0.002	0.010
Mean	0.061	0.062	0.032	0.037	0.079	0.065	0.046	0.055	0.044	0.045	0.026	0.037	0.044	0.034	0.041	0.045	0.044	0.039
Max	0.420	0.363	0.103	0.183	0.290	0.430	0.113	0.172	0.110	0.120	0.067	0.113	0.108	0.135	0.160	0.096	0.419	0.070
Median	0.038	0.042	0.024	0.019	0.080	0.054	0.040	0.052	0.038	0.044	0.024	0.034	0.036	0.030	0.040	0.045	0.022	0.035
TSS (mg/L)																		
N	244	131	95	128	218	125	89	125	122	126	152	125	186	246	38	184	518	10
Min	0.50	0.50	0.50	0.50	0.50	0.10	0.50	0.50	0.50	0.50	0.10	0.50	1.00	0.25	0.50	2.30	2.00	6.00
Mean	18.82	10.93	15.52	10.66	25.92	9.83	19.71	7.94	18.91	7.94	19.41	8.49	27.62	11.02	13.16	17.28	15.80	11.50
Max	274.00	35.00	50.00	79.00	442.20	56.00	97.00	54.00	109.00	160.20	156.00	32.00	319.00	73.00	45.00	116.50	68.00	17.00
Median	17.00	10.00	12.00	8.54	13.00	8.00	12.00	6.40	12.45	4.80	10.35	7.80	16.00	8.00	10.83	16.00	15.00	11.00
DO (mg/L)																		
N	251	128	95	123	218	123	89	122	122	123	152	124	184	238	199	299	512	
Min	6.56	3.20	7.44	6.60	6.15	5.80	7.11	3.22	6.37	3.16	6.19	6.80	5.44	5.90	7.90	7.57	7.00	
Mean	10.53	10.01	10.18	9.96	9.79	10.37	9.89	9.57	9.46	9.24	10.33	9.84	10.08	9.80	10.05	10.24	10.23	
Max	17.00	20.00	14.38	13.81	14.75	14.70	12.67	14.35	13.39	12.75	14.81	12.35	13.40	15.70	14.00	13.84	19.70	
Median	10.48	9.74	9.86	9.80	9.70	10.50	9.60	9.59	9.08	9.26	10.49	9.79	10.10	9.77	10.09	10.25	9.80	
pH																		
N	252	128	95	124	218	125	89	125	122	125	152	126	181	241	199	290	519	
Min	6.90	7.20	7.58	7.04	7.30	7.60	7.84	7.14	7.00	7.17	7.80	7.65	6.80	7.20	7.46	5.98	7.30	
Mean	8.57	8.52	8.38	8.47	8.35	8.40	8.27	8.34	8.15	8.25	8.17	8.39	8.30	8.37	8.26	8.23	8.62	
Max	9.40	10.40	8.93	10.38	8.95	10.21	8.81	10.17	8.79	10.27	8.60	10.29	9.10	10.30	9.19	9.73	10.00	
Median	8.60	8.55	8.40	8.41	8.37	8.37	8.28	8.32	8.16	8.22	8.15	8.35	8.30	8.36	8.26	8.27	8.70	
Temp. (°C)																		
N	310	129	95	123	218	124	89	124	122	124	152	124	186	239	202	300	518	
Min	-1.00	-2.14	1.16	-1.20	1.47	1.68	2.88	1.68	1.56	2.05	2.04	1.98	0.90	1.36	3.18	5.73	0.40	
Mean	11.12	11.10	12.01	11.69	13.95	12.53	12.93	12.86	12.81	12.80	12.02	12.83	12.89	12.99	13.66	13.79	12.61	
Max	24.20	24.40	22.02	24.20	23.90	24.00	19.85	21.00	21.00	23.00	20.24	21.00	22.00	22.00	20.53	21.82	28.90	
Median	11.10	10.88	11.27	11.70	14.47	12.10	12.91	12.30	13.17	12.27	10.64	12.55	13.15	12.90	13.63	13.37	12.60	

	IDEQ and USGS														Idaho Power		TFCC[4]	NSCC[4]
	Milner Pool		Pillar Falls		Crystal Springs		Box Canyon		Gridley Bridge		Shoestring Bridge		King Hill		King Hill		Milner Dam	Milner Dam
	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	>2000	>2000
Turbidity (NTU)[1]																		
N	119	106	95	115	152	112	89	114	122	116	152	116	103	116	185	238	522	
Min	1.70	1.70	0.10	1.70	0.10	1.17	0.10	0.70	0.10	0.80	1.50	1.40	0.30	1.00	0.90	1.50	2.00	
Mean	10.44	12.90	10.88	10.05	13.42	12.80	13.67	10.56	14.15	13.00	11.21	9.98	10.60	10.03	13.28	7.40	7.94	
Max	40.10	208.90	30.80	76.10	41.20	240.00	69.40	158.30	62.50	454.40	71.20	68.20	88.00	88.30	133.00	58.10	26.00	
Median	9.20	8.29	9.30	7.70	12.00	6.20	10.00	6.36	12.15	5.55	6.60	5.65	4.30	5.60	9.40	6.40	7.00	
TN (mg/L)																		
N	201	119	95	124	218	124	89	125	122	125	152	125	142	152	99	305	518	
Min	0.02	0.22	0.45	0.43	0.51	0.80	0.84	0.98	0.87	1.12	0.88	0.92	0.54	0.90	0.78	1.00	0.36	
Mean	0.80	1.24	1.24	2.10	2.02	2.54	1.92	2.71	1.74	2.31	1.38	2.10	1.48	1.98	1.53	1.84	0.91	
Max	2.40	4.13	3.30	4.74	4.02	4.57	4.88	5.34	3.49	5.41	2.00	5.50	3.62	4.40	2.51	3.14	5.14	
Median	0.70	1.06	1.05	2.03	2.12	2.55	1.69	2.63	1.78	2.23	1.39	2.04	1.41	1.91	1.52	1.85	0.75	
TKN (mg/L)																		
N	201	119	95	124	218	124	89	125	122	125	152	125	142	152	99	305	518	
Min	0.01	0.20	0.23	0.18	0.05	0.10	0.18	0.07	0.20	0.13	0.19	0.05	0.04	0.05	0.05	0.05	0.26	
Mean	0.47	0.71	0.49	0.65	0.43	0.58	0.47	0.53	0.45	0.50	0.39	0.47	0.26	0.40	0.44	0.45	0.58	
Max	1.88	1.91	1.19	1.90	1.34	1.80	1.04	1.60	1.09	2.71	0.75	2.68	1.47	2.28	1.10	1.33	1.44	
Median	0.37	0.60	0.46	0.58	0.41	0.55	0.44	0.47	0.43	0.40	0.36	0.38	0.18	0.35	0.42	0.42	0.54	
NO3 + NO2 (mg/L)[2]																		
N	252	131	95	124	218	124	89	125	122	125	152	125	181	245	99	305	518	
Min	0.01	0.01	0.04	0.05	0.17	0.38	0.35	0.55	0.38	0.58	0.32	0.59	0.44	0.06	0.43	0.51	0.01	
Mean	0.35	0.49	0.74	1.44	1.59	1.97	1.45	2.17	1.29	1.81	0.99	1.64	1.23	1.48	1.09	1.38	0.33	
Max	2.06	3.67	2.55	4.02	3.15	3.89	4.04	5.03	2.82	3.75	1.69	3.38	3.19	3.92	1.85	2.56	4.76	
Median	0.16	0.26	0.64	1.32	1.69	1.97	1.32	2.10	1.29	1.75	1.03	1.60	1.22	1.44	1.18	1.40	0.12	
NH3 (mg/L)																		
N	252	131	95	124	218	124	89	125	122	125	152	125	182	245	99	305	518	
Min	0.0003	0.0025	0.0030	0.0025	0.0060	0.0025	0.0120	0.0190	0.0110	0.0025	0.0100	0.0025	0.0030	0.0025	0.0050	0.0050	0.0050	
Mean	0.0266	0.0833	0.0391	0.0662	0.0875	0.0916	0.0772	0.0968	0.0616	0.0769	0.0299	0.0580	0.0412	0.0375	0.0387	0.0274	0.0383	
Max	0.3000	0.7330	0.2480	0.4650	0.3733	0.5530	0.3695	0.5710	0.2710	0.4650	0.1054	0.4500	0.1590	0.4700	0.1500	0.2400	0.2700	
Median	0.0200	0.0500	0.0222	0.0500	0.0700	0.0655	0.0610	0.0800	0.0510	0.0600	0.0260	0.0500	0.0310	0.0200	0.0250	0.0200	0.0300	
Chlorophyll-*a* (micrograms per liter [µg/L})[3]																		
N	106	117	21	123	21	124	21	124	25	125	9	124	21	124	120	289	471	
Min	2.10	2.20	8.52	1.68	2.13	0.88	3.02	1.25	0.49	0.02	2.14	0.53	2.48	0.91	0.50	1.13	0.50	
Mean	24.84	25.34	19.84	21.91	11.76	13.83	9.90	11.26	13.14	10.32	8.19	13.40	11.39	14.42	10.53	20.33	33.72	
Max	114.00	168.00	60.29	74.00	32.35	70.00	30.94	65.00	38.74	61.00	21.74	98.00	38.25	98.00	133.20	148.88	142.00	
Median	18.35	17.00	14.73	17.00	11.04	10.05	7.50	7.30	10.68	6.60	4.06	8.20	6.93	8.44	6.65	15.20	25.00	
Pheophytin (µg/L)																		
N		115	21	121	21	123	21	123	25	124	9	123	21	123				
Min		0.26	0.41	0.23	1.22	0.02	0.78	0.06	0.12	0.02	0.48	0.02	0.96	0.03				

	IDEQ and USGS														Idaho Power		TFCC[4]	NSCC[4]
	Milner Pool		Pillar Falls		Crystal Springs		Box Canyon		Gridley Bridge		Shoestring Bridge		King Hill		King Hill		Milner Dam	Milner Dam
	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	<2000	>2000	>2000	>2000
Mean		7.91	4.00	6.14	4.44	4.15	3.57	3.24	2.16	2.43	2.03	3.09	4.45	4.13				
Max		56.55	9.88	45.90	10.24	30.00	11.83	18.23	5.66	12.00	5.96	19.76	12.35	18.00				
Median		4.40	4.20	3.80	4.13	2.50	2.76	2.47	2.07	1.70	1.31	2.40	4.03	3.15				
TP, filtered (mg/L)																		
N	2												91	27				
Min	0.01												0.01	0.01				
Mean	0.02												0.05	0.04				
Max	0.03												0.59	0.07				
Median	0.02												0.04	0.05				
Ortho-P, unfiltered (mg/L)																		
N	13												12					
Min	0.02												0.03					
Mean	0.16												0.06					
Max	0.31												0.13					
Median	0.12												0.06					

[1] Field turbidity measurements were used for summary.

[2] NO3 + NO2 for Idaho Power is reported as NO3 only.

[3] Chlorophyll ***a*** data from varying sources may reflect different lab analysis methods.

[4] TFCC = Twin Falls Canal Co.; NSCC = North Side Canal Co.

Note: blank cells indicate no data available.

Table 21. Comparison of Total Phosphorus (Mean and Sample Size) for Each Tributary with Available IDEQ or USGS Data

Stream or Spring	Agency	WY 1990–1999		WY 2000–2012	
		Mean	Count	Mean	Count
5th Fork Rock Creek: headwaters to Rock Creek	IDEQ	-	-	0.04	4
Alpheus Creek: headwaters to mouth	IDEQ	-	-	0.02	3
Bickle Springs: headwaters to mouth	IDEQ	-	-	0.02	4
Billingsley Creek: headwaters to mouth	IDEQ	-	-	0.07	5
Blind Canyon Creek (Cedar Draw Creek): headwaters to mouth	IDEQ	-	-	0.82	3
Blind Canyon Spring near Buhl, ID 08S 14E 28BDD1S (13095400)	USGS	-	-	0.16	3
Blue Lakes Spring Bel Pump Plant near Twin Falls,ID (13090999)	USGS	0.03	6	0.01	17
Box Canyon Creek: headwaters to mouth	IDEQ	-	-	0.02	5
Box Canyon Springs near Wendell, ID	USGS	0.01	35.00	0.015	18
Briggs Creek: headwaters to mouth	IDEQ	-	-	0.03	5
Briggs Spring at Head near Buhl, ID	USGS	0.01	7.00	0.02	2
Cedar Draw: headwaters to mouth	IDEQ	-	-	0.15	9
Cedar Draw at Clover Road (3900 N.) Near Filer, ID	USGS	-	-	0.1355	2
Clear Springs: headwaters to mouth	IDEQ	-	-	0.12	6
Clover Creek: headwaters to Pioneer Reservoir	IDEQ	-	-	0.08	8
Clover Creek: Pioneer Reservoir to mouth	IDEQ	-	-	0.02	2
Clover Creek near King Hill, ID	USGS	-	-	0.01	2
Cottonwood Creek: headwaters to mouth (at Foothill Road)	IDEQ	-	-	0.13	1
North Cottonwood Creek near Rogerson, ID	USGS	-	-	0.09	2
Crystal Springs: headwaters to mouth	IDEQ	-	-	0.03	6

Stream or Spring	Agency	WY 1990–1999		WY 2000–2012	
		Mean	Count	Mean	Count
Devils Washbowl Spring near Kimberly 10S 18E 04AAD1S	USGS	-	-	0.02	2
Deep Creek: headwaters to mouth	IDEQ	-	-	0.22	5
Dry Creek: headwaters to Murtaugh Lake	IDEQ	-	-	0.14	3
Ellison Creek	IDEQ	-	-	0.03	5
Malad River	IDEQ	-	-	3	4
McMullen Creek	IDEQ	-	-	0.14	3
Mud Creek	IDEQ	-	-	0.14	5
Niagara Springs	IDEQ	-	-	0.02	6
Pioneer Reservoir	IDEQ	-	-	0.16	4
Riley Creek	IDEQ	-	-	0.04	5
Riley Lake	IDEQ	-	-	0.02	4
Rock Creek: headwaters to Rock Creek Town	IDEQ	-	-	0.03	45
Rock Creek: Rock Creek Town to mouth	IDEQ	-	-	0.08	161
Rock Creek at Highway 30/93 crossing at Twin Falls, ID	USGS	0.09	86	0.10	111
Rock Creek at USFS Footbridge near Rock Creek, ID	USGS	-	-	0.03	2
Salmon Falls Creek: headwaters to mouth	IDEQ	-	-	0.09	5
Sand Springs: headwaters to mouth	IDEQ	-	-	0.04	5
Thousand Springs (Ritter Springs): headwaters to mouth	IDEQ	-	-	0.02	5
Tool Box Creek: headwaters to 5th Fork Rock Creek	IDEQ	-	-	0.05	2
Vinyard Creek: headwaters to mouth	IDEQ	-	-	0.03	6

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Appendix F. Point Source Dischargers

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Table 22. Point Source Dischargers' Existing TP Load and Wasteload Allocations (WLA)

NPDES ID	GAP	Facility Name	WLA: Annual Average TP Load (lb/day)	Minimum: Annual Average TP Load (lb/day)	Average: Annual Average TP Load (lb/day)	Maximum: Annual Average TP Load (lb/day)	Count of Records	Year Range
ID0020061		FILER, CITY OF - FILER WWTP	17	3.8	4.7	7.3	26	2003 - 2011
ID0020168		JEROME, CITY OF - JEROME WWTP	205	151.3	190.6	247.6	83	2005 - 2011
ID0020664		BUHL, CITY OF - BUHL WWTP	17.4	6.0	18.1	22.3	116	2001 - 2012
ID0021270		TWIN FALLS, CITY OF - TWIN FALLS WWTP	710	363.0	499.3	627.5	120	2001 - 2012
ID0022446		HANSEN, CITY OF	3.3	1.3	1.6	1.9	51	2007 - 2012
ID0025941		HAGERMAN, CITY OF	5.7	2.5	3.4	4.9	17	2007 - 2011
ID0027600[1]		JEROME CHEESE COMPANY	0.04	0.0	0.8	1.5	101	2003 - 2011
IDG130001	1	IDAHO SPRINGS	36.9	0.7	3.4	6.4	59	2002 - 2007
IDG130002	2	SNAKE RIVER FARM	49	37.4	39.7	42.0	120	2001 - 2011
IDG130003	3	IDAHO DEPARTMENT OF FISH AND GAME - HAGERMAN STATE FISH HATCHERY	17.2	4.9	8.5	11.5	84	2001 - 2011
IDG130004	4	U.S. FISH AND WILDLIFE SERVICE - HAGERMAN NATIONAL FISH HATCHERY	12.2	2.7	5.2	7.1	87	2001 - 2011
IDG130005	5	JONES FISH HATCHERY	18.3	11.0	13.5	16.3	118	2001 - 2011
IDG130006	6	CLEAR SPRINGS FOODS INC - CRYSTAL SPRINGS TROUT FARM	87	66.9	85.1	130.7	120	2001 - 2011
IDG130007	7	CLEAR SPRINGS FOODS INC - CLEAR LAKE FARM	74.5	59.8	63.9	73.3	120	2001 - 2011
IDG130008	8	BLUE LAKES TROUT COMPANY	69.2	14.2	38.3	49.7	118	2001 - 2011
IDG130009	9	SEAPAC OF IDAHO INC - MAGIC SPRINGS HATCHERY	50.1	20.0	27.5	32.7	120	2001 - 2011
IDG130010	10	RIM VIEW TROUT COMPANY - WENDELL HATCHERY	66.3	31.8	40.7	54.6	121	2001 - 2011
IDG130011	11	CLEAR LAKES TROUT FARM	70.9	28.1	42.0	61.4	120	2001 - 2011
IDG130013	13	IDAHO DEPARTMENT OF FISH AND GAME - NIAGARA SPRINGS FISH HATCHERY	14.4	3.0	7.4	10.4	82	2001 - 2011
IDG130014	14	CLEAR SPRINGS FOODS INC	141	103.5	117.6	128.9	120	2001 - 2011

NPDES ID	GAP	Facility Name	WLA: Annual Average TP Load (lb/day)	Minimum: Annual Average TP Load (lb/day)	Average: Annual Average TP Load (lb/day)	Maximum: Annual Average TP Load (lb/day)	Count of Records	Year Range
IDG130015	15	RANGEN INC	7.9	2.4	3.5	8.9	97	2001 - 2011
IDG130016	16	IDAHO DEPARTMENT OF FISH AND GAME - MAGIC VALLEY STEELHEAD HATCHERY	15.2	-26.2	-1.2	6.4	52	2002 - 2011
IDG130018	18	SEAPAC OF IDAHO INC - PRISTINE SPRINGS HATCHERY	26.8	1.8	18.6	50.4	120	2001 - 2011
IDG130020	20	WHITE SPRINGS TROUT FARM - HAGERMAN HATCHERY	13.5	3.5	6.1	9.8	120	2001 - 2011
IDG130026	26	WHITE WATER RANCH	4.3	1.9	2.8	3.3	15	2008 - 2011
IDG130028	28	IDAHO TROUT COMPANY - RAINBOW TROUT FARMS FILER HATCHERY	5.3	0.6	2.0	3.5	35	2002 - 2011
IDG130029	29	RAINBOW TROUT FARMS BUHL HATCHERY	3.8	0.4	1.5	3.3	34	2002 - 2011
IDG130036	36	CANYON TROUT FARM	4.7	-0.3	0.1	0.4	6	2008 - 2010
IDG130040	40	TUNNEL CREEK	3.3	0.6	1.8	3.0	42	2003 - 2011
IDG130041	41	FISH BREEDERS OF IDAHO INC - CATFISH FARM	16.3	7.1	8.5	11.0	45	2008 - 2011
IDG130046	46	SEAPAC OF IDAHO	3.7	-11.3	-2.1	1.9	16	2008 - 2011
IDG130049	49	BELL FISH PONDS	1.2	0.0	0.4	0.8	8	2004 - 2011
IDG130053	53	JACK'S PONDS	6.7	-1.7	1.8	12.3	19	2002 - 2011
IDG130054	54	CLEAR SPRINGS FOODS INC	29.5	6.5	22.8	27.5	94	2003 - 2011
IDG130056	56	FISH BREEDERS OF IDAHO - BIG BEND TROUT FARM	12.1	1.4	4.4	6.8	25	2004 - 2011
IDG130057	57	BOSWELL TROUT FARMS - COX'S PONDS	6.6	-3.1	0.7	2.9	19	2002 - 2011
IDG130059	59	ARK FISHERIES INC - OLSON PONDS	1.2	0.3	0.9	2.9	25	2001 - 2011
IDG130060	60	BLIND CANYON HATCHERY	3.8	-1.1	2.3	4.6	16	2008 - 2011
IDG130061	61	TEN SPRINGS HATCHERY	13.8	6.1	9.0	11.5	106	2002 - 2011
IDG130062	62	ARK FISHERIES INC - BIRCH CREEK	4.3	1.3	1.5	1.7	16	2008 - 2011
IDG130063	63	WHITE'S HATCHERY	1.6	0.2	0.5	0.8	15	2001 - 2011
IDG130064	64	SWEETWATER FARM	4.8	-1.5	0.5	1.8	8	2001 - 2011

NPDES ID	GAP	Facility Name	WLA: Annual Average TP Load (lb/day)	Minimum: Annual Average TP Load (lb/day)	Average: Annual Average TP Load (lb/day)	Maximum: Annual Average TP Load (lb/day)	Count of Records	Year Range
IDG130065	65	ARK FISHERIES INC - BUCKEYE FARMS	7.5	0.0	2.6	14.5	23	2002 - 2011
IDG130066	66	BILLINGSLEY CREEK RANCH	2.3	1.0	1.6	2.2	18	2001 - 2007
IDG130069	69	DOLANA TROUT FARMS INC	1.8	0.7	1.4	2.0	8	2008 - 2011
IDG130070	70	ARK FISHERIES INC - JUKER FARM PONDS	1.3	0.4	0.8	1.3	25	2001 - 2011
IDG130076	76	LEMMON PONDS	1.9	0.3	1.0	1.7	21	2003 - 2011
IDG130077	77	DEEP CREEK PONDS	6.1	-2.0	-1.2	-0.1	7	2008 - 2010
IDG130082	82	BILLINGSLEY BAY FARMS	11	0.2	1.8	3.0	20	2004 - 2011
IDG130083	83	TALBOTT TROUT FARM	2.5	0.1	0.1	0.1	12	2005 - 2005
IDG130087	87	AWALT FAMILY REVOCABLE TRUST	2.9	0.0	0.5	1.4	9	2008 - 2011
IDG130090	90	FISH BREEDERS OF IDAHO - SMITH'S PONDS	7.7	2.9	5.4	14.2	30	2002 - 2011
IDG130096	96	BOYER PONDS	1.6	0.0	0.1	0.1	13	2004 - 2005
IDG130098	98	LYNCLIF FARMS	3.8	0.4	0.6	0.8	7	2008 - 2011
IDG130103	103	STUTZMAN FARM PONDS	0.6	0.2	0.4	0.7	14	2003 - 2011
IDG130104	104	CANYON SPRINGS	12.2	3.0	7.4	10.6	16	2008 - 2011
IDG130109	109	RCP - RICK AND CHERYL EGGLESTON	1.4	0.0	0.2	0.3	6	2007 - 2010
IDG130111	111	FISH BREEDERS OF IDAHO - HENSLEE HATCHERY	2.9	0.2	1.9	8.2	12	2004 - 2011
IDG130112	112	LIVELY, ROBIN AND TERRY - LIVELY FARM POND	1.7	0.7	2.2	4.1	4	2008 - 2011
IDG130116	116	FIRST ASCENT FISH FARM	7.2	2.6	3.5	4.8	17	2007 - 2011
IDG130118	118	WHITE WATER FISHERIES INC - SLANE POND	1.9	0.5	0.5	0.6	14	2008 - 2011
IDG130119	119	WHITE WATER FISHERIES INC	2.7	0.6	0.9	1.3	15	2008 - 2011
IDG130120	120	WHITE WATER FISHERIES INC	2.4	1.4	1.5	1.7	16	2008 - 2011
IDG130124	124	COLLEGE OF SOUTHERN IDAHO (CSI) FISH TECHNOLOGY PROGRAM - CSI FISH HATCHERY	2.2	0.2	1.0	1.7	26	2003 - 2011
IDG130131	131	TUPPER PONDS	0.3	0.2	0.4	0.6	6	2004 - 2007
IDG130133	133	BAKER PLACE	4.6	2.6	2.9	3.2	13	2008 - 2011

NPDES ID	GAP	Facility Name	WLA: Annual Average TP Load (lb/day)	Minimum: Annual Average TP Load (lb/day)	Average: Annual Average TP Load (lb/day)	Maximum: Annual Average TP Load (lb/day)	Count of Records	Year Range
IDG132001[1]		CLEAR LAKES TROUT PROCESSING	3.3	0.4	0.5	0.7	44	2008 - 2011
IDG132002[1]		CLEAR SPRINGS FOODS INC - FISH PROCESSING PLANT	20.2	9.0	10.6	13.1	47	2008 - 2011
IDG132003[1]		RAINBOW TROUT FARMS INC	2.5	0.8	1.1	1.3	48	2007 - 2011
IDG132004[1]		SEAPAC OF IDAHO	4.7	1.2	1.5	2.1	46	2008 - 2011

[1] Facility WLA was not included in USR TMDL Modification documents (IDEQ 2004, 2005). The value reported for WLA in this table is the current permit limit for average TP load (in pounds per day).

Appendix G. Detailed Flow Balance Methods

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A flow balance was developed for the mainstem of the Middle Snake River using continuous discharge data from five USGS gage sites (Figure 35). The five mainstem USGS gages, listed from upstream to downstream, were Milner Dam (13088000), Kimberly (13090000), Buhl (13094000), Lower Salmon Falls near Hagerman (13135000), and King Hill (13154500). Annual average flow along the mainstem was calculated for each gage for WY 2000–2009 (Table 23). Mainstem flow between each of the five USGS gages was then calculated by subtracting the upstream gage annual average flow from the closest downstream gage annual average flow, starting with Milner Dam at the farthest upstream location. The result of this calculation is the "total inflow" for the reach length between each of the five USGS gages (Table 24); from this point forward these reach lengths will be referred to as USGS segments. The calculation used to determine total inflow for each "USGS segment" is provided in Equation 1; *i* and *j* in this equation represent two consecutive USGS gages.

Equation 1:

$$Downstream\ annual\ average\ flow_j - upstream\ annual\ average\ flow_i = USGS\ segment\ total\ inflow_{i\ to\ j}$$

Table 23. Annual Average Flow at USGS Gages, WY 2000–2009

USGS Gage	Annual Average Flow (cfs) at USGS Gage									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Milner Dam (13088000)	2,740	441	337	336	285	519	2,268	1,014	668	2,553
Kimberly (13090000)	3,061	761	617	613	552	771	2,484	1,323	942	2,764
Buhl (13094000)	4,665	2,148	2,016	1,953	1,860	2,053	3,947	2,726	2,308	4,309
Lower Salmon Falls near Hagerman (13135000)	8,101	5,586	5,299	5,169	5,079	5,225	7,186	5,832	5,481	7,498
King Hill (13154500)	9,992	7,332	6,899	6,646	6,520	6,759	9,379	7,462	7,082	9,045

Table 24. Total Inflow for USGS Segments by Water Year

USGS Segment	Total Inflow (cfs) between USGS Gages									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Milner Dam to Kimberly	322	320	280	276	266	252	216	309	274	210
Kimberly to Buhl	1,604	1,387	1,400	1,340	1,309	1,281	1,463	1,404	1,367	1,545
Buhl to Lower Salmon Falls near Hagerman	3,436	3,438	3,282	3,216	3,218	3,172	3,238	3,105	3,173	3,190

USGS Segment	Total Inflow (cfs) between USGS Gages									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Lower Salmon Falls near Hagerman to King Hill	1,891	1,746	1,600	1,477	1,441	1,534	2,193	1,630	1,601	1,546

Average baseflow, defined as stream flow that is primarily from diffuse ground water inflow occurring within the same reach without surface expression as springs, was obtained from the IDWR ESPAM efforts (Wylie 2012) and was used to determine baseflow contributions to each USGS segment. ESPAM provided baseflow values as averages from 1980 to 2008 or 2009, depending on the segment, for USGS segments between Kimberly and Buhl, Buhl and Lower Salmon Falls near Hagerman, and Lower Salmon Falls near Hagerman and King Hill USGS gages. Baseflow values were not provided for the USGS segment between Milner Dam and Kimberly USGS gages; therefore, these flows are considered unaccounted waters in the mass balance analysis described below.

Baseflow was incorporated into the flow balance as a percent of the average reach gain estimated for each reach from 1980 to 2008 or 2009, depending on the segment (Wylie 2012 (Table 25). These percentages were applied to the USGS segment total inflows to determine the baseflow contribution for each USGS segment (Table 26). Although a constant percentage was assumed for each USGS segment, the percent of reach gain from baseflow is not expected to be constant because baseflow is believed to occur at a lower elevation than spring discharge and is assumed to be less sensitive to changes in aquifer head. Baseflow is expected to become a slightly larger percentage of the total flow as reach gains decrease.

Table 25. Percent of Reach Gain from Baseflow (Wylie 2012)

USGS Segment	Average Reach Gain from 1980 to 2008(9) (cfs)[1]	Average Reach Baseflow from 1980 to 2008(9) (cfs)[1]	Percent of Reach Gain from Baseflow
Kimberly to Buhl	1,105	265	24.0%
Buhl to Lower Salmon Falls	3,370	907	26.9%
Lower Salmon Falls to King Hill	1,539	365	23.7%

[1] Average reach gain and reach baseflow values displayed here were taken from IDWR ESPAM efforts (Wylie 2012).

Table 26. Example Calculations for WY 2000 Baseflow Contributions to USGS Segment Total Inflow

USGS Segment	WY 2000 USGS Segment Total Inflow (cfs)[1]	Percent of Reach Gain from Baseflow[2]	WY 2000 Baseflow Contribution (cfs)
Milner Dam to Kimberly	322	Not Provided	Unaccounted For
Kimberly to Buhl	1,604	24.0%	385
Buhl to Lower Salmon Falls near Hagerman	3,436	26.9%	924

USGS Segment	WY 2000 USGS Segment Total Inflow (cfs)[1]	Percent of Reach Gain from Baseflow[2]	WY 2000 Baseflow Contribution (cfs)
Lower Salmon Falls near Hagerman to King Hill	1,891	23.7%	448

[1] Flow obtained from Table 24.

[2] Percentages from Table 25.

As an intermediate step in the flow balance, total mainstem inflow and baseflow contributions for each USGS segment were proportioned to the six study segments based on the percent of USGS segment length that was coincident with each study segment (Figure 35); Table 27 lists these percentages. An example calculation used to proportion flow from USGS segments to the Milner Dam to Pillar Falls study segment is provided in Equation 2.

Equation 2:

$$\begin{aligned}&(\%\ of\ USGS\ segment_{MD\ to\ K} * USGS\ segment\ total\ inflow_{MD\ to\ K})\\&\quad + (\%\ of\ USGS\ segment_{K\ to\ B} * USGS\ segment\ total\ inflow_{K\ to\ B})\\&\quad + (\%\ of\ USGS\ segment_{B\ to\ L} * USGS\ segment\ total\ inflow_{B\ to\ L})\\&\quad + (\%\ of\ USGS\ segment_{L\ to\ H} * USGS\ segment\ total\ inflow_{L\ to\ H})\\&\quad = Study\ segment\ total\ inflow_{MD\ to\ PF}\end{aligned}$$

where MD = Milner Dam, K = Kimberly, B = Buhl, L = Lower Salmon Falls near Hagerman, H = King Hill, and PF = Pillar Falls.

Table 28 presents the calculated total inflows for study segments. The calculation performed to determine baseflow contributions for each study segment was similar to Equation 2 except that USGS segment total inflow was replaced with USGS segment baseflow contribution.

Table 27. Percent of USGS Segments Coincident with Study Segments

USGS Segment	Percent of USGS Segment Coincident with Each Study Segment			
	USGS: Milner Dam to Kimberly	USGS: Kimberly to Buhl	USGS: Buhl to Lower Salmon Falls Near Hagerman	USGS: Lower Salmon Falls Near Hagerman to King Hill
Milner Dam to Pillar Falls	100%	20%	0%	0%
Pillar Falls to Crystal Springs	0%	63%	0%	0%
Crystal Springs to Box Canyon	0%	17%	36%	0%
Box Canyon to Gridley Bridge	0%	0%	23%	0%
Gridley Bridge to Shoestring Bridge	0%	0%	41%	25%
Shoestring Bridge to King Hill Bridge	0%	0%	0%	74%

Table 28. Total Inflow Calculated for Study Segments

USGS Segment	Total Inflow (cfs) for Study Segments									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Milner Dam to Pillar Falls	636	592	554	539	523	503	503	584	542	513
Pillar Falls to Crystal Springs	1,014	877	885	847	827	810	925	887	864	977
Crystal Springs to Box Canyon	1,504	1,467	1,413	1,380	1,375	1,354	1,409	1,351	1,369	1,405
Box Canyon to Gridley Bridge	785	785	750	735	735	725	740	709	725	729
Gridley Bridge to Shoestring Bridge	1,895	1,860	1,759	1,701	1,693	1,697	1,888	1,693	1,714	1,707
Shoestring Bridge to King Hill Bridge	1,393	1,287	1,180	1,088	1,062	1,131	1,616	1,201	1,180	1,140

The final step in the flow balance was to determine the remaining contributing sources of flow for each study segment. Because data availability was limited, this flow balance was calculated by subtracting known contributing sources from total inflow to determine unaccounted flow for each study segment. Equation 3 provides an example calculation of unaccounted flow for a single study segment.

Equation 3:

$$study\ segment\ total\ inflow - (baseflow + tributary\ flow + spring\ flow + irrigation\ return\ drain\ flow + direct\ point\ source\ flow) = study\ segment\ unaccounted\ flow$$

The results of the flow balance are provided in Table 16 in Section 7.