

Water Quality Monitoring in the Clearwater Basin: Continuing Citizen Science

Supplemental Project Agreement 16-PA-11011600-040
Contract Completion Report for 2018 and 2019 Field Years

November 2020

Joann Wallenburn, Emily McGuirt, Bruce Rieman Clearwater Resource Council

Introduction

In 2013 and 2016 the Clearwater Resource Council in collaboration with the Southwest Crown Collaborative, local schools, volunteers, and neighboring organizations conducted extensive sampling to describe turbidity, Total Suspended Solids (TSS) and nutrient concentrations (Total Nitrogen and Phosphorous) in Clearwater Basin streams (Rieman and Wallenburn 2014, Rieman and Wallenburn 2015, Rieman and Wallenburn 2017). In 2016 sampling extended across the basin including most of the major tributaries to the larger valley bottom lakes. Turbidity, TSS, total N, and total P were sampled in 15 streams throughout the spring runoff. Turbidity was sampled in an additional 13 streams over the same period. Results indicated that water quality varied substantially within and among streams across the basin and that continued work would be useful to resolve important nutrient sources potentially influencing the lakes, refine monitoring techniques and build a foundation to understand long-term change.

Sampling in 2017 replicated 15 streams sampled in 2016 and added five more streams where turbidities in 2016 indicated that water quality could be of concern or where nutrient samples had not been collected in the past because of limited funding, logistical constraints or oversight. The 2017 samples represented the most complete look at water quality across the major tributary streams of the Clearwater Basin above Salmon Lake to date (Rieman, Mitchell and Wallenburn 2018). Samples were collected weekly from mid March through June 2017, a period typically encompassing more than 80% of total discharge in the basin.

Further synoptic work was not planned after 2017. However, in late summer 2017 two large wildfires, the Liberty Fire (>28,000 acres) and the Rice Ridge Fire (~160,000 acres), burned across parts of the Clearwater Basin. At least five streams experienced moderate or severe fire in a substantial portion their watersheds. It was generally agreed that continued monitoring of burned and unburned streams would be valuable. Sampling continued in 2018 and 2019, until funds were exhausted.

Sample sites are shown in Figure 1 and described in Appendix A. All 2018 and 2019 raw data are available in Appendix B. As the purpose of this continued monitoring was solely to generate a post-fire dataset to accompany the pre-fire data, no discussion, conclusions or recommendations are presented at this time.

Detailed monitoring of stream flow, water quality and estimates of annual nutrient loading in Morrell Creek through the Seeley-Swan High School's Students-In-Action Project also continued in 2018 and 2019, and will be summarized in a separate report.

References

- Rieman, B.E., and J. Wallenburn. 2014. Water quality monitoring to determine the influence of roads and road restoration on turbidity and downstream nutrients: a pilot study with citizen science. Completion report Southwest Crown CFLRP, Agreement # 12-PA-11011600-039 (available online: <https://static1.squarespace.com/static/573f50e4e32140034604e862/t/5806251d1b631b4e18972d54/1476797741933/2014+Adopt+a+Stream+Report.pdf>)
- Rieman, B and J. Wallenburn. 2015. Water quality monitoring to determine the influence of roads and road restoration on turbidity and downstream nutrients: a pilot study with citizen science. Addendum to the Completion report Southwest Crown CFLRP, Agreement # 12-PA-11011600-039 (available on line: <https://static1.squarespace.com/static/573f50e4e32140034604e862/t/580625501b631b4e18972f2d/1476797782003/Addendum+to+Water+Quality+Report+Final.pdf>)
- Rieman, B. and J Wallenburn. 2017. Water quality monitoring in the Clearwater Basin including data from the Swan and Blackfoot Basins: Continuing Citizen Science. Completion report for the Southwest Crown CFLRP, Supplemental Project Agreement 16-PA-11011600-040. With Technical support from Shane Hendrickson, Elaine Caton, Jennifer Schoonen, Joe Zimbric and Sara Halm (available on line: https://static1.squarespace.com/static/573f50e4e32140034604e862/t/58ff59f2e3df280d3d0889ae/1493129728111/2016_Adopt-A-Stream_annual_report.pdf)
- Wallenburn, J., C Mitchell, and B. Rieman. 2018. Water quality monitoring in the Clearwater Basin: Continuing Citizen Science. Addendum to the Completion Report for 2017 Southwest Crown CFLRP, Supplemental Project Agreement 16-PA-11011600-040. https://static1.squarespace.com/static/573f50e4e32140034604e862/t/5d55780f96ab020001834220/1565882388479/2017_Adopt-A-Stream-annual_report081519.pdf

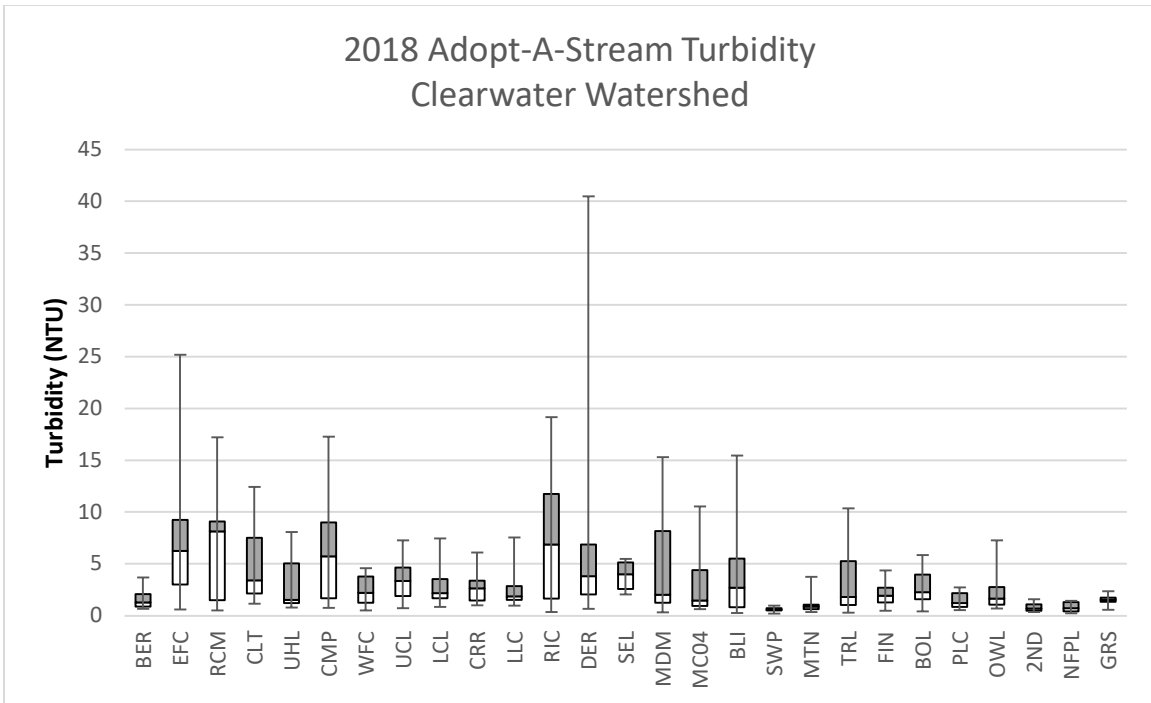


Figure 2. Turbidity in 27 sites in the Clearwater Basin, mid-March through June 2018. The vertical lines show the range of samples. The tops/bottoms of the bars show the 25th, 50th (median), and 75th quartiles. The codes for stream names are in Appendix A.

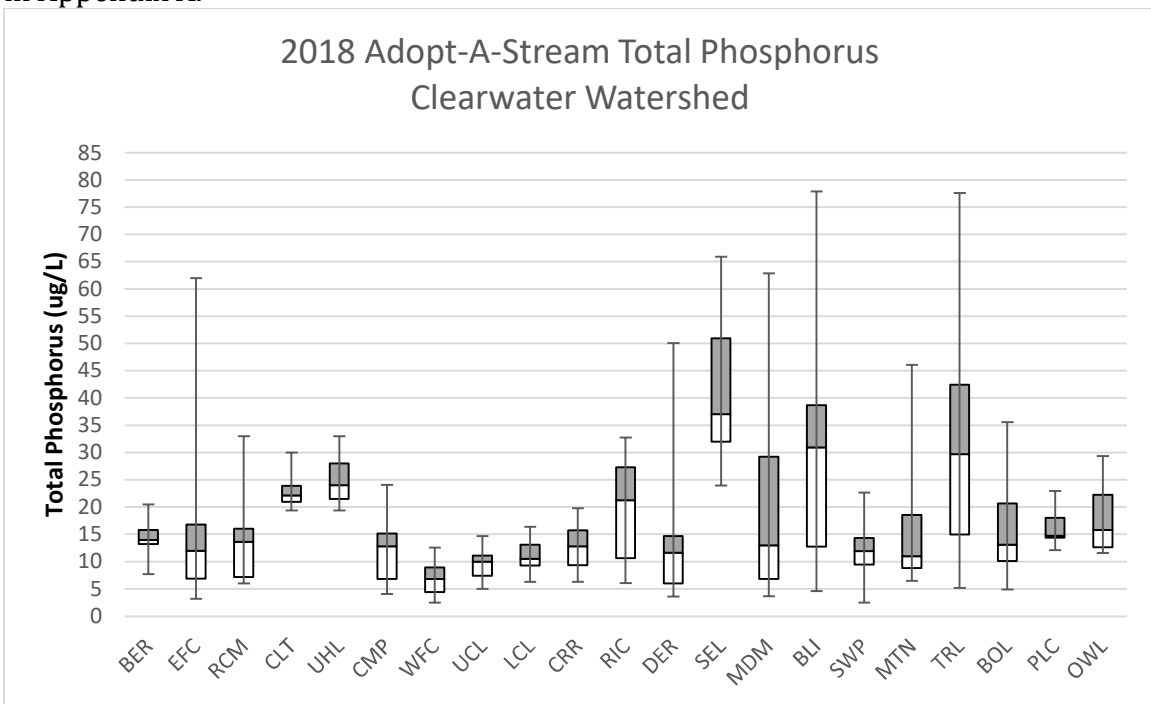


Figure 3. Total phosphorous in 21 sites in the Clearwater Basin, March through June 2018. The vertical lines show the range of samples. The tops/bottoms of the bars show the 25th, 50th (median), and 75th quartiles. The codes for stream names are in Appendix A.

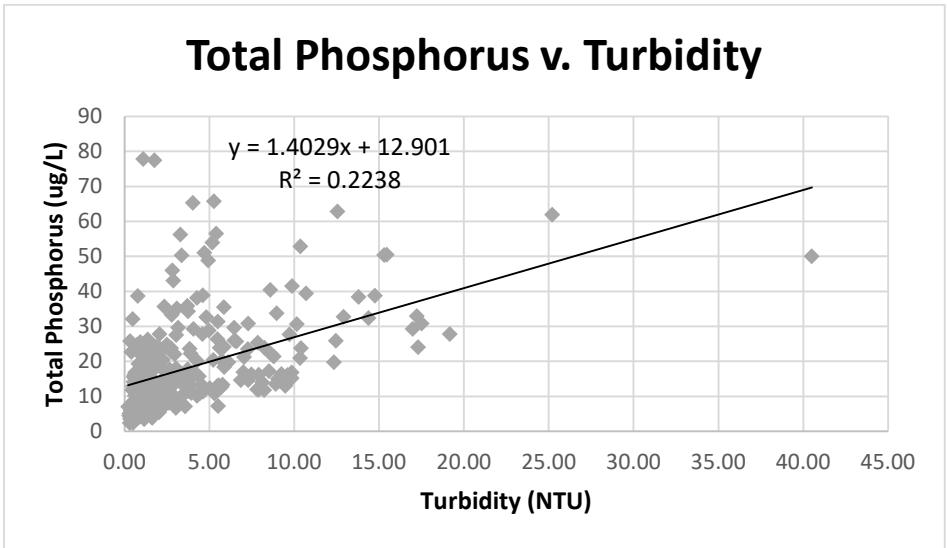
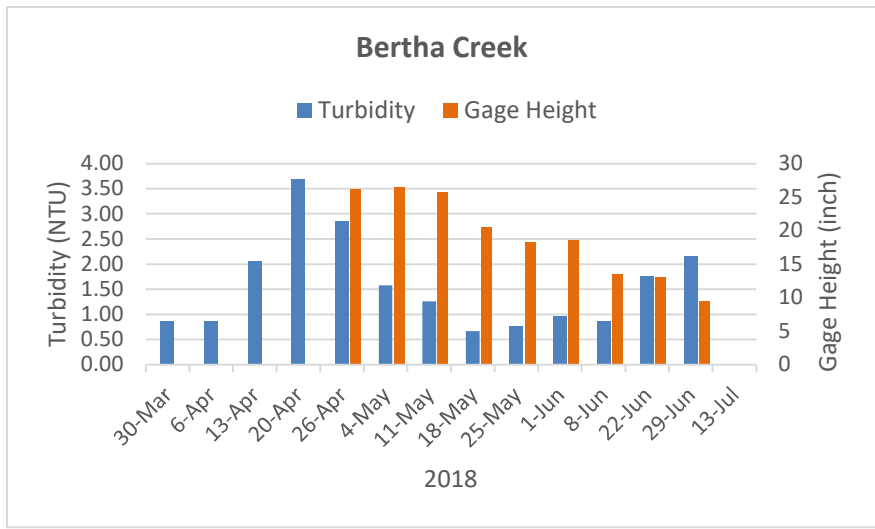
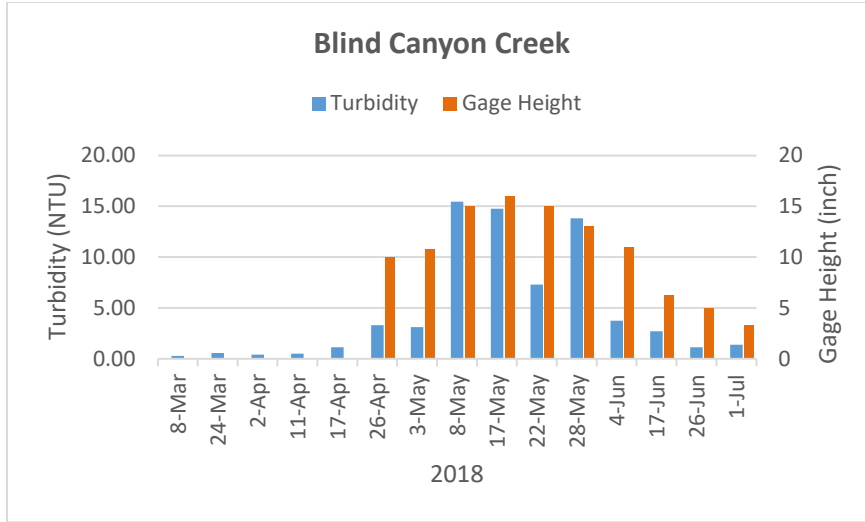


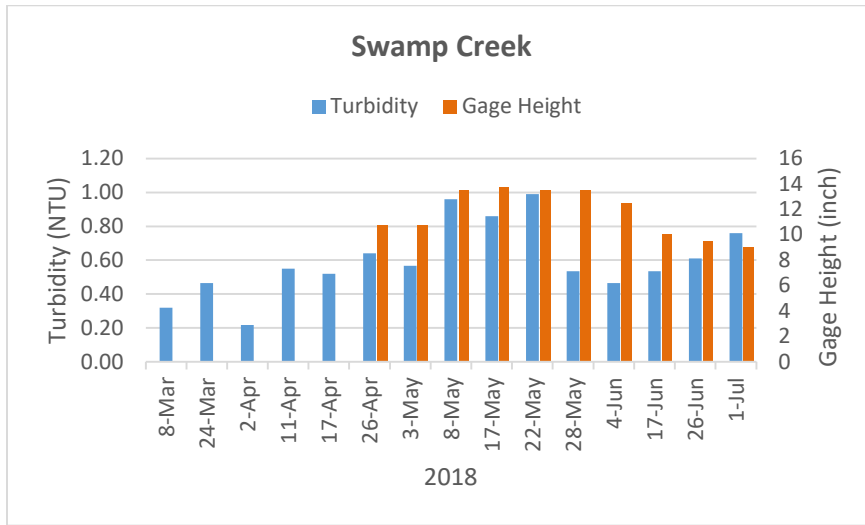
Figure 4. Associations of total phosphorous with turbidity across all sites sampled in the Clearwater Basin during runoff in 2018.



A.



B.



C.

Figure 5. Associations of total phosphorous with turbidity in three sites (A=BER, B=BLI, C=SWP) sampled in the Clearwater Basin during runoff in 2018.

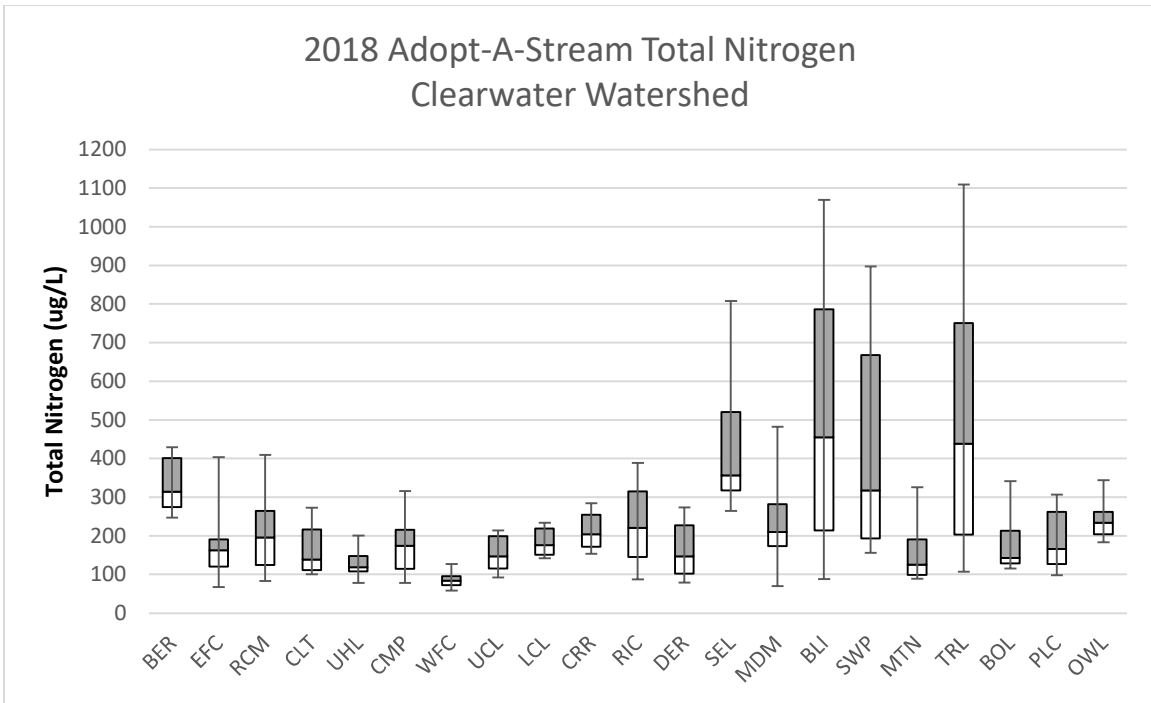


Figure 6. Total nitrogen in 21 sites in the Clearwater Basin, March through June 2018. The vertical lines show the range of samples. The tops/bottoms of the bars show the 25th, 50th (median), and 75th quartiles. The codes for stream names are in Appendix A.

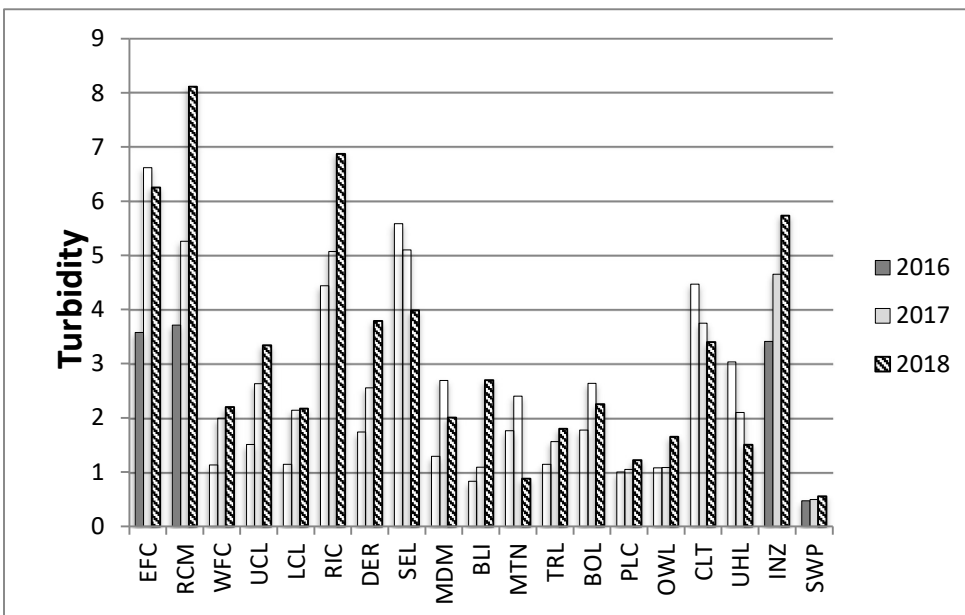


Figure 7. Median turbidity in 19 sites in the Clearwater Basin sampled from mid March through June in 2016, 2017, and 2018.

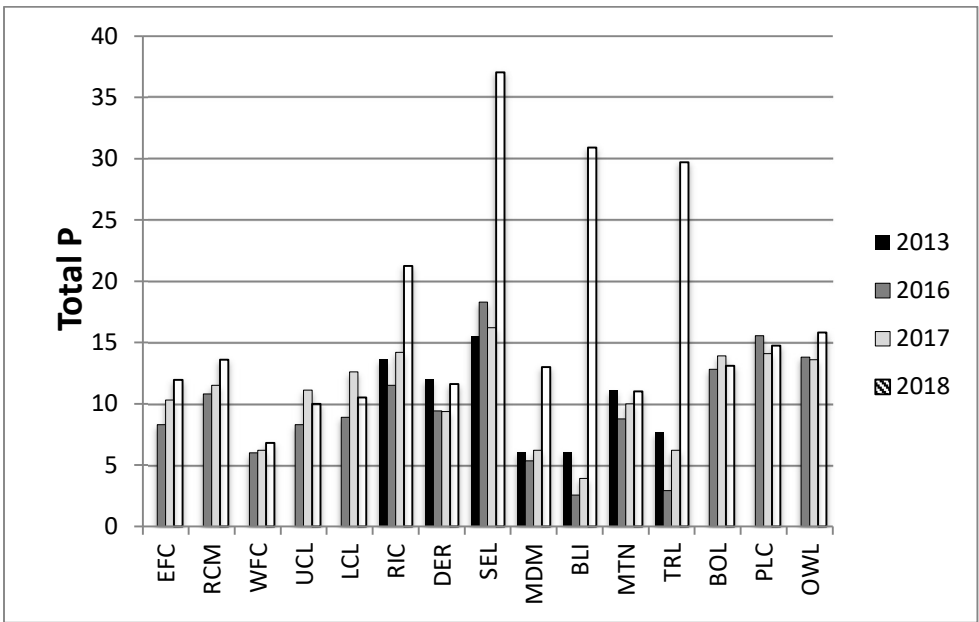


Figure 8. Median total P in 15 sites in the Clearwater Basin sampled from mid March through June in 2016 and 2017 and 7 sites sampled in 2013, 2016, 2017, and 2018.

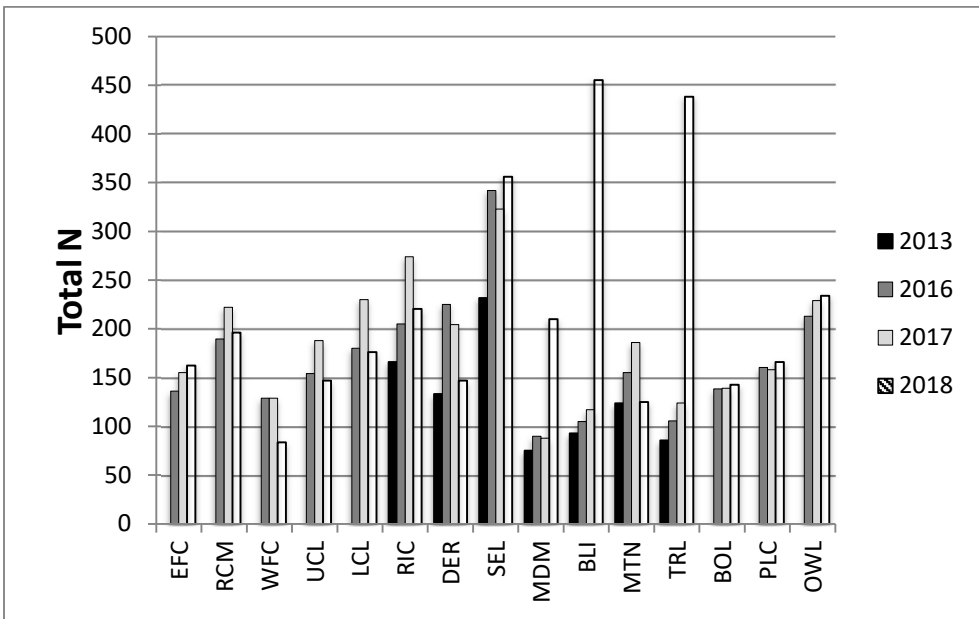


Figure 9. Median total N in 15 sites in the Clearwater Basin sampled from mid March through June in 2016 and 2017 and 7 sites sampled in 2013, 2016, 2017, and 2018.

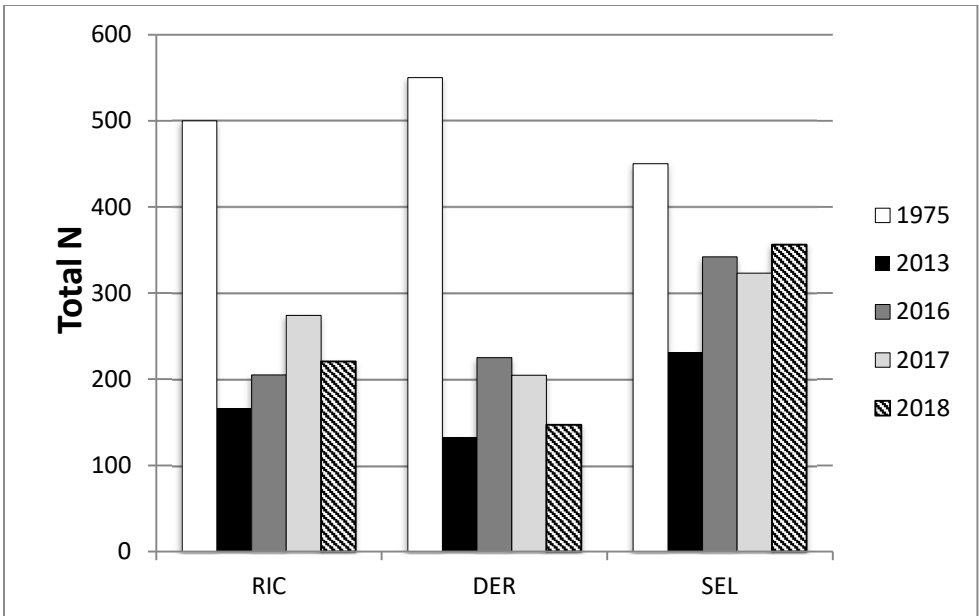


Figure 10. Median total N in three streams (RIC, DER, SEL) sampled in 1975, 2013, 2016, 2017, and 2018.

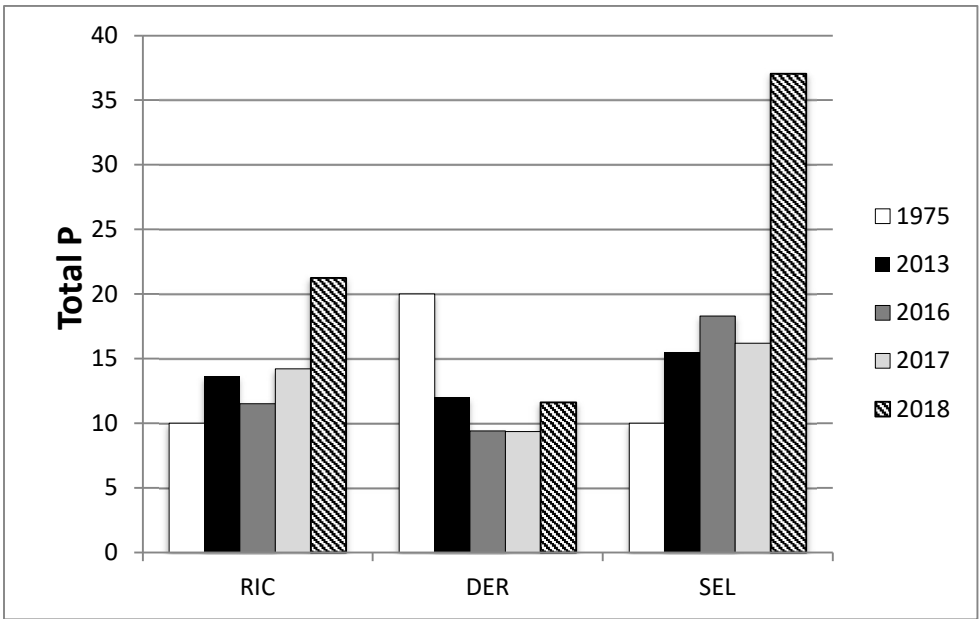


Figure 11. Median total P in three streams (RIC, DER, SEL) sampled in 1975, 2013, 2016, 2017, and 2018.

Appendices 2018

Appendix A (2018). Sampling sites for Clearwater Basin water quality in 2018. Tier 1 streams were also sampled in 2013. Tier 1, tier 2 and tier 3 streams were sampled weekly throughout the runoff and included stage, turbidity, total nitrogen and total phosphorus. Tier 4 streams were sampled only for turbidity; and some were sampled only occasionally.

Site Name	Site Code	Latitude °N	Longitude °W	Elevation (ft)	Drainage Area (km ²)	Mean Annual Flow (cfs)	Mean Summer Flow (cfs)	Mean August Flow (cfs)
Tier 1: Prior AAS sites								
Morrell Creek @ Cottonwood Lakes Rd	MDM	47.19403	-113.45562	4194	68.39	40.47	57.22	19.19
Trail Creek @ Cottonwood Lakes Road	TRL	47.19064	-113.43141	4265	40.01	19.94	23.56	7.45
Blind Canyon Creek > Trail Creek	BLI	47.19705	-113.42330	4281	23.88	12.23	14.29	4.50
Deer Creek @ Boy Scout Road	DER	47.21035	-113.54176	4042	51.70	25.14	19.34	7.99
Seeley Creek @ SOS Road	SEL	47.18307	-113.48162	4124	13.51	2.98	2.35	1.85
Mountain Creek @ Stockings	MTN	47.17679	-113.42311	4386	16.88	5.40	5.07	2.46
Rice Creek @ Ranger Station Rd	RIC	47.21526	-113.52072	4065	7.38	1.50	1.24	0.92
Swamp Creek	SWP	47.18862	-113.42317	4333	12.12	5.87	6.72	2.20
Tier 2: Major Tributaries								
East Fork Clearwater R. @ Hwy 83	EFC	47.34684	-113.58779	4180	45.15	28.11	26.10	9.37
West Fork Clearwater R. @ USFS Rd 463	WFC	47.25227	-113.58351	4153	87.65	65.41	60.77	16.76
Richmond Creek @ Hwy 83 (est.)	RCM	47.32545	-113.57875	4239	5.02	1.91	1.61	0.77
Placid Creek > Boles Creek	PLC	47.11986	-113.54896	4137	128.16	64.79	52.60	20.89
Boles Creek > Placid Creek	BOL	47.11953	-113.54912	4136	51.52	34.60	26.67	9.08
Owl Creek > Clearwater R. (est.)	OWL	47.11589	-113.45695	3953	235.89	110.90	87.32	36.11
Clearwater R. < Seeley Lake	LCL	47.18433	-113.51684	3960	385.29	171.64	145.36	59.13
Clearwater R. > Seeley Lake	UCL	47.23570	-113.53805	4045	258.31	131.57	113.95	42.14

Appendix A (continued)

Site Name	Site Code	Latitude °N	Longitude °W	Elevation (ft)	Drainage Area (km2)	Mean Annual Flow (cfs)	Mean Summer Flow (cfs)	Mean August Flow (cfs)
Tier 3: Tribs w/ lot of USFS and/or activity								
Camp Creek @ Hwy 83	INZ	47.27176	-113.55724	4150	28.64	9.83	8.40	4.27
Uhler Creek @ Westside Road	UHL	47.29386	-113.58204	4203	8.49	2.99	1.59	1.02
Colt Creek @ FSR 646	CLT	47.32857	-113.59657	4474	10.20	4.08	2.06	1.29
Bertha Creek @ Summit Park Rd	BER	47.36367	-113.59835	4110	13.68	4.23	2.39	1.60
Tier 4: Other interesting tribs or sites, turbidities only								
Finley Creek	FIN	47.13879	-113.59158	4280	5.41	1.63	1.04	0.68
North Fork Placid Creek	NFP	47.17440	-113.65852	4652	25.79	24.02	28.16	6.78
Grouse Creek	GRS	47.16216	-113.64738	4605	6.85	3.18	1.82	1.06
2nd Creek	2ND	47.17694	-113.68010	4890	7.99	5.34	2.82	1.32
Lower Drew Creek	LDR	47.15262	-113.45359	4062	13.68	3.03	2.27	1.74
Clearwater R. @ Wagon Wheel Way Bridge	LLC	47.15060	-113.48213	3960	394.57	173.19	146.68	60.21
Morrell Creek @ Hwy 83	MC04	47.14579	-113.46528	3976	159.17	40.47	57.22	19.19

Appendix B 2018. Clearwater Valley Water Quality Data collected in 2018. Gage represents water depth either on a temporary staff installed at the sampling site or on a permanent gage. Negative values represent water levels that fell below the bottom of the gage and were measured from that point with a hand held ruler.

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen ug/L-N MDL: 25.0	Total Phosphorus ug/L-P MDL: 1.5
03/23/18	9:00	2ND			0.47		
03/31/18	9:22	2ND			0.53		
04/05/18	10:06	2ND			0.46		
04/20/18	13:45	2ND			1.12		
04/25/18	10:30	2ND			1.32		
05/02/18	12:00	2ND			1.59		
05/12/18	15:10	2ND			1.11		
05/16/18	15:30	2ND			1.03		
05/25/18	9:00	2ND			0.78		
06/01/18	9:28	2ND			0.78		
06/08/18	10:17	2ND			0.55		
06/22/18	9:35	2ND			0.58		
06/29/18	10:10	2ND			0.47		
07/11/18	11:09	2ND			0.37		
03/30/18	10:40	BER			0.86	269	7.7
04/06/18	12:15	BER			0.86	265	7.9
04/13/18	11:15	BER			2.07	283	13.9
04/20/18	13:15	BER			3.68	274	14.9
04/26/18	12:30	BER	26.25	IN	2.84	247	13.2
05/04/18	11:35	BER	26.5	IN	1.58	283	12.5
05/11/18	12:30	BER	25.75	IN	1.26	314	14.3
05/18/18	11:15	BER	20.5	IN	0.67	349	13.4
05/25/18	11:40	BER	18.25	IN	0.77	401	15.8
06/01/18	11:30	BER	18.50	IN	0.98	430	19.9
06/08/18	11:15	BER	13.50	IN	0.87	418	17
06/22/18	11:05	BER	13.00	IN	1.77	365	14
06/29/18	10:45	BER	9.50	IN	2.16	427	20.5
07/13/18	11:00	BER					
03/08/18	12:55	BLI			0.27	574	4.6
03/24/18	13:25	BLI			0.54	1070	14.2
04/02/18	14:10	BLI			0.40	1020	22.8

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
04/11/18	11:00	BLI			0.49	969	32.2
04/17/18	14:55	BLI			1.10	996	77.9
04/26/18	10:45	BLI	10.00	IN	3.29	604	56.3
05/03/18	10:35	BLI	10.75	IN	3.09	455	35.2
05/08/18	9:55	BLI	15.00	IN	15.45	473	50.6
05/17/18	11:17	BLI	16.00	IN	14.75	344	38.9
05/22/18	9:53	BLI	15.00	IN	7.28	269	30.9
05/28/18	12:17	BLI	13.00	IN	13.80	255	38.5
06/04/18	11:05	BLI	11.00	IN	3.72	172	17.8
06/17/18	13:10	BLI	6.25	IN	2.70	120	11.3
06/26/18	9:40	BLI	5.00	IN	1.12	120	8.9
07/01/18	16:15	BLI	3.25	IN	1.37	88.3	7.5
03/12/18	10:45	BOL			0.42	116	4.9
03/25/18	15:55	BOL			2.29	140	10.1
04/06/18	11:10	BOL	7.75	IN	1.53	122	8.8
04/13/18	10:45	BOL	15.75	IN	3.99	216	15.7
04/18/18	8:30	BOL	20	IN	4.59	299	27.9
04/22/18	14:25	BOL	27.75	IN	5.86	342	35.6
05/03/18	15:15	BOL	33	IN	3.89	204	22.3
05/11/18	15:10	BOL			5.86	226	24.2
05/16/18	15:05	BOL	34.00	IN	3.66	164	12.7
05/24/18	10:00	BOL	32.00	IN	2.22	137	14.7
05/30/18	12:55	BOL	29.00	IN	2.18	127	13.5
06/05/18	12:25	BOL	21.00	IN	1.64	120	10.1
06/28/18	10:40	BOL	13.00	IN	1.56	145	12.6
07/14/18	10:05	BOL	11.00	IN	1.29	132	9.2
04/17/18	11:10	CLT			12.45	273	26
04/23/18	10:27	CLT			7.05	219	21.3
04/30/18	10:50	CLT	10.5	IN	10.40	216	23.9
05/08/18	10:13	CLT	15.50	IN	8.96	216	33.8
05/12/18	12:00	CLT	11.50	IN	6.48	162	26.1
05/18/18	12:20	CLT	11.75	IN	3.85	128	23.7
05/25/18	12:45	CLT	9.50	IN	2.74	113	23.9
06/01/18	12:25	CLT	8.75	IN	2.95	139	22.1
06/08/18	12:05	CLT	7.00	IN	2.25	138	20.6
06/22/18	11:55	CLT	5.50	IN	1.79	107	21.3
06/29/18	11:40	CLT	4.00	IN	1.65	101	19.4

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
07/13/18	12:00	CLT	3.50	IN	1.17	102	20.5
03/24/18	15:10	CMP			9.49	176	13.1
03/30/18	12:15	CMP	15.00	IN	7.82	174	12.1
04/06/18	13:50	CMP			5.55	167	13.3
04/13/18	12:20	CMP			9.86	205	15.3
04/20/18	14:35	CMP			8.52	226	17.3
04/26/18	13:30	CMP	22.75	IN	8.60	316	22.3
05/04/18	12:50	CMP			9.40	238	15.0
05/11/18	13:45	CMP			17.30	250	24.1
05/18/18	12:00	CMP			5.73	190	12.8
05/25/18	13:05	CMP				138	9.8
05/25/18	14:15	CMP			3.38		
06/01/18	12:45	CMP	10.00	IN	2.38	135	7.6
06/08/18	12:45	CMP	12.00	IN	0.95	88.2	4.8
06/22/18	12:35	CMP	11.25	IN	0.83	93.6	5.4
06/29/18	12:15	CMP	10.50	IN	0.84	78.8	4.1
07/13/18	12:45	CMP	8.50	IN	0.76	92.9	6
03/24/18	16:10	CRR			1.52	195	9.4
04/05/18	10:10	CRR			2.33	255	11.6
04/12/18	9:25	CRR			2.83	285	14
04/20/18	8:30	CRR			3.15	282	16.3
04/25/18	8:20	CRR			3.43	284	15.5
05/03/18	8:45	CRR			4.13	253	16.9
05/09/18	8:15	CRR			6.12	239	19.8
05/16/18	8:45	CRR			4.39	213	15.8
05/23/18	8:30	CRR			2.87	186	15.1
05/30/18	8:30	CRR			2.41	154	11.5
06/06/18	9:55	CRR			1.43	171	8.9
06/20/18	14:25	CRR			1.04	175	9.3
06/27/18	11:05	CRR			1.00	166	7.7
07/11/18	11:15	CRR			1.14	166	6.3
04/05/18	11:10	DER			2.04	209	5.6
04/12/18	8:50	DER			5.46	274	13
04/20/18	9:00	DER	1	FT	3.16	232	8
04/25/18	8:50	DER	1	FT	3.79	227	11.6
05/03/18	9:15	DER	1	FT	9.25	215	16.5
05/09/18	8:50	DER	1.60	FT	40.50	262	50.1

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
05/12/18	13:30	DER	1.00	FT			
05/16/18	9:25	DER	1.20	FT	10.35	147	21
05/23/18	9:10	DER	2.90	FT	6.85	102	14.7
05/30/18	9:00	DER	2.50	FT	5.02	96	12.4
06/06/18	10:20	DER	2.30	FT	2.97	108	9
06/20/18	14:45	DER	1.70	FT	1.04	99	6
06/27/18	11:35	DER	1.60	FT	0.72	103	4.9
07/11/18	11:40	DER	1.35	FT	0.67	79.6	3.6
03/30/18	11:15	EFC	7.75	IN	5.51	152	7.3
04/06/18	12:30	EFC	7.75	IN	3.03	134	6.8
04/13/18	11:40	EFC	10.25	IN	9.61	193	16.2
04/20/18	13:30	EFC	11.5	IN	8.23	183	11.9
04/26/18	12:50	EFC	16.75	IN	9.57	195	15.6
05/04/18	11:50	EFC	21.5	IN	7.91	173	12
05/11/18	12:45	EFC	22.50	IN	25.20	404	62
05/18/18	11:30	EFC	18.24	IN	4.27	175	20.2
05/25/18	11:55	EFC	15.50	IN	17.50	198	30.9
06/01/18	11:45	EFC	14.75	IN	7.00	152	17
06/08/18	11:30	EFC	11.50	IN	3.00	116	7.2
06/22/18	11:20	EFC	7.75	IN	1.64	76.3	3.9
06/29/18	11:00	EFC	7.00	IN	1.17	76.7	3.6
07/13/18	11:15	EFC	0.25	IN	0.60	67.8	3.2
03/23/18	9:25	FIN			3.10		
03/31/18	9:50	FIN			4.37		
04/05/18	10:39	FIN			2.65		
04/20/18	15:20	FIN			1.65		
04/25/18	11:40	FIN			1.99		
05/02/18	10:30	FIN			3.16		
05/12/18	14:30	FIN			1.17		
05/16/18	15:50	FIN			2.21		
05/25/18	8:35	FIN			1.86		
06/01/18	10:33	FIN			2.69		
06/08/18	9:40	FIN			0.88		
06/22/18	8:30	FIN			1.61		
06/29/18	9:07	FIN			0.73		
07/11/18	10:47	FIN			0.48		
03/23/18	8:35	GRS			1.52		

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen ug/L-N MDL: 25.0	Total Phosphorus ug/L-P MDL: 1.5
03/31/18	9:00	GRS			1.19		
04/05/18	9:40	GRS			1.42		
04/20/18	14:40	GRS			1.70		
04/25/18	11:10	GRS			2.00		
05/12/18	15:50	GRS			1.77		
05/16/18	15:00	GRS			1.74		
05/25/18	9:30	GRS			1.12		
06/01/18	10:07	GRS			1.44		
06/08/18	10:00	GRS			1.55		
06/22/18	9:00	GRS			2.37		
06/29/18	9:45	GRS			1.35		
07/11/18	11:27	GRS			0.58		
04/05/18	11:25	LCL			2.46	220	9.3
04/12/18	9:05	LCL			2.17	234	9.5
04/20/18	8:45	LCL			2.16	211	10.4
04/25/18	8:40	LCL			1.99	209	10.6
05/03/18	9:00	LCL			3.87	219	13.3
05/09/18	8:40	LCL			7.47	223	16.4
05/16/18	9:00	LCL			4.53	176	13.5
05/23/18	8:50	LCL			3.52	171	13.1
05/30/18	8:50	LCL			2.66	150	10.5
06/06/18	10:15	LCL			1.68	169	11.8
06/20/18	14:35	LCL			0.93	146	6.8
06/27/18	11:20	LCL			0.90	151	6.4
07/11/18	11:30	LCL			0.84	142	6.3
05/11/18	15:35	LDR			13.30		
03/23/18	10:35	LLC	1.00	FT	1.36		
03/24/18	16:40	LLC			1.87	194	8.4
03/31/18	11:20	LLC	1.50	FT	2.06		
04/05/18	12:02	LLC	1.54	FT	1.67		
04/13/18	14:00	LLC	1.98	FT	2.26	218	10.7
04/24/18	11:45	LLC	3.04	FT	2.14		
05/03/18	16:15	LLC	>3	FT	5.12		
05/11/18	15:20	LLC			7.57		
05/16/18	16:30	LLC			4.76		
05/25/18	10:50	LLC			3.44		
06/01/18	11:13	LLC	3.32	FT	1.85		

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
06/08/18	11:08	LLC	2.66	FT	1.71		
06/22/18	10:50	LLC	1.90	FT	0.99		
06/29/18	11:00	LLC	1.66	FT	1.26		
07/11/18	12:45	LLC	1.20	FT	1.17		
03/19/18	15:15	MC01			1.22	195	3.4
04/04/18	10:37	MC01			1.37	266	15.8
04/07/18	15:30	MC01	1.46	FT	0.55		
04/18/18	11:26	MC01			1.74	299	11.1
04/25/18	10:37	MC01			2.28	345	19.1
05/02/18	15:15	MC01			2.67	337	29.1
05/11/18	11:45	MC01	3.92	FT	10.25		
05/12/18	10:45	MC01	3.46	FT	9.06		
05/13/18	12:30	MC01	3.31	FT	5.61		
05/15/18	10:10	MC01				288	33.4
05/16/18	12:30	MC01	4.04	FT	13.13		
05/18/18	15:15	MC01	3.50	FT	4.56		
05/28/18	12:00	MC01	3.79	FT	6.92		
06/02/18	17:00	MC01	2.89	FT	8.99		
06/04/18	10:30	MC01				204	18.7
06/10/18	14:15	MC01	3.18	FT	5.44		
06/20/18	17:45	MC01	2.93	FT	2.15	88.8	11.3
07/01/18	14:00	MC01	2.11	FT	1.35		
07/23/18	12:30	MC01	1.51	FT	0.44	100.9	7.1
03/23/18	10:30	MC04	0.94	FT	0.84		
03/24/18	16:50	MC04	1.00	FT	0.84	507	9.4
03/31/18	11:10	MC04	1.16	FT	1.46		
04/05/18	11:52	MC04	1.08	FT	0.73		
04/13/18	14:10	MC04	1.27	FT	1.46	582	13.6
04/24/18	11:50	MC04	1.8	FT	1.49		
05/03/18	16:10	MC04	2.28	FT	4.52		
05/11/18	15:30	MC04	>3.33	FT	10.00		
05/16/18	16:25	MC04	3.10	FT	10.57		
05/25/18	10:45	MC04	3.15	FT	8.65		
06/01/18	11:06	MC04	2.76	FT	4.26		
06/08/18	11:00	MC04	2.08	FT	2.45		
06/22/18	10:42	MC04	1.52	FT	1.08		
06/29/18	10:52	MC04	1.20	FT	1.02		

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
07/11/18	12:35	MC04	0.90	FT	0.65		
03/05/18	12:45	MDM	0.30	FT	0.34	194	3.7
03/26/18	10:35	MDM	0.40	FT	1.24	297	7.5
04/02/18	17:00	MDM	4.4	FT	0.69	203	8.6
04/08/18	15:28	MDM	0.4	FT	0.50	152	5.9
04/17/18	13:15	MDM			2.00	243	13.0
04/26/18	16:35	MDM	1.34	FT	12.55	483	62.9
05/02/18	9:15	MDM	1.48	FT	4.97	362	28.9
05/02/18	9:30	MDM	1.48	FT	4.61	424	39.0
05/08/18	15:25	MDM	2.10	FT	15.30	402	50.5
05/17/18	11:50	MDM	2.10	FT	10.15	267	30.7
05/22/18	9:20	MDM	1.86	FT	5.75	228	20.3
05/28/18	11:50	MDM	1.94	FT	9.72	200	27.8
06/04/18	10:40	MDM	1.68	FT	6.59	210	25.8
06/17/18	12:40	MDM	1.06	FT	1.87	104	9.6
06/26/18	8:55	MDM	1.00	FT	1.39	80	5
06/26/18	9:05	MDM	1.00	FT	1.49	85	6.2
07/01/18	15:40	MDM	0.76	FT	1.27	70.5	6.1
03/08/18	14:45	MTN			0.51	89.3	13.0
03/24/18	10:30	MTN			1.51	175	8.9
04/02/18	11:45	MTN			0.93	158	25.6
04/08/18	11:20	MTN			0.88	125	17.3
04/17/18	11:35	MTN			2.82	293	46.1
04/26/18	15:20	MTN			3.75	326	34.4
05/02/18	11:00	MTN			1.19	230	19.8
05/08/18	11:45	MTN	19.00	IN	0.88	206	16
05/17/18	10:10	MTN	21.50	IN	0.78	150	11
05/22/18	7:30	MTN	19.00	IN	0.76	124	8.8
05/28/18	10:20	MTN	17.50	IN	0.59	100	8.8
06/04/18	9:50	MTN	14.50	IN	0.67	124	9.2
06/17/18	11:10	MTN	10.75	IN	0.35	95.5	7.6
06/26/18	8:06	MTN	9.00	IN	0.88	92.6	7.7
07/01/18	12:55	MTN	8.50	IN	0.46	97.7	6.5
03/23/18	8:20	NFPL			0.45		
03/31/18	9:10	NFPL			0.24		
04/05/18	9:52	NFPL			0.29		
04/20/18	14:08	NFPL			0.65		

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
04/25/18	10:50	NFPL			1.35		
05/02/18	12:15	NFPL			1.12		
05/12/18	14:55	NFPL			1.42		
05/16/18	15:20	NFPL			1.43		
05/25/18	8:50	NFPL			1.35		
06/01/18	9:40	NFPL			1.02		
06/08/18	10:10	NFPL			0.79		
06/22/18	9:22	NFPL			0.67		
06/29/18	10:00	NFPL			0.37		
07/11/18	11:15	NFPL			0.27		
03/12/18	11:20	OWL			0.70	197	11.6
03/25/18	16:55	OWL			1.10	201	12.0
04/06/18	12:10	OWL	11.25	IN	0.89	217	12.0
04/13/18	12:30	OWL	16.5	IN	1.81	260	18.1
04/18/18	11:30	OWL	27.5	IN	2.28	292	23.7
04/22/18	15:40	OWL	31.5	IN	3.06	323	27.6
05/03/18	16:00	OWL			4.38		
05/04/18	10:30	OWL			4.07	250	29.4
05/11/18	11:55	OWL			7.27	255	23.6
05/12/18	16:45	OWL	9.50	IN			
05/16/18	16:40	OWL	3.50	IN	2.90	218	16.4
05/24/18	10:30	OWL			1.49	195	16.9
05/24/18	16:00	OWL	22.00	IN			
05/30/18	16:30	OWL	19.50	IN	1.32	184	15.1
06/05/18	14:00	OWL	14.25	IN	0.98	214	15.2
06/28/18	12:50	OWL	3.50	IN	2.23	344	14.5
07/14/18	11:10	OWL			1.02	262	11.6
03/12/18	10:35	PLC			0.53	182	12.1
03/25/18	15:30	PLC			1.16	268	14.6
04/06/18	11:25	PLC	11.5	IN	1.22	263	14.4
04/13/18	10:50	PLC	21.25	IN	2.24	307	20.5
04/18/18	8:40	PLC	25.5	IN	2.66	281	17.8
04/22/18	14:35	PLC	31.25	IN	2.74	259	23.0
05/03/18	15:10	PLC	36	IN	2.20	185	18.1
05/11/18	12:35	PLC			2.02	150	19
05/16/18	15:00	PLC	35.00	IN	1.70	132	14.9
05/24/18	10:05	PLC	32.25	IN	1.22	112	14.5

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
05/30/18	13:00	PLC	28.00	IN	0.92	98.7	13.9
06/05/18	12:30	PLC	20.25	IN	0.81	134	13.3
06/28/18	10:45	PLC	13.25	IN	0.58	125	14.4
07/14/18	10:10	PLC	10.25	IN	0.57	108	16.2
03/24/18	15:30	RCM			9.86	236	16.9
03/30/18	11:30	RCM			8.91	222	13.6
04/06/18	13:00	RCM			9.15	196	14.5
04/13/18	11:55	RCM			12.35	267	19.8
04/20/18	14:00	RCM			9.05	268	15.1
04/26/18	13:05	RCM	9.25	IN	8.79	322	21.5
05/04/18	12:10	RCM	14	IN	8.12	261	14.1
05/11/18	13:00	RCM			17.22	410	33
05/12/18	11:30	RCM	10.50	IN			
05/18/18	11:45	RCM	7.00	IN	4.27	181	10.2
05/25/18	12:10	RCM	6.75	IN	2.01	135	9.3
06/01/18	11:55	RCM	6.00	IN	1.92	157	7.6
06/08/18	11:45	RCM	1.50	IN	1.06	113	6
06/22/18	11:35	RCM	2.75	IN	0.74	108	6.5
06/29/18	11:15	RCM	3.50	IN	0.65	106	6.7
07/13/18	11:30	RCM	1.25	IN	0.52	83.4	6.7
03/24/18	14:55	RIC			16.98	344	29.4
04/05/18	10:35	RIC			7.92	255	16.3
04/12/18	8:20	RIC			12.90	389	32.8
04/20/18	9:25	RIC			8.26	353	24.0
04/25/18	9:15	RIC			7.86	329	25.4
04/26/18	13:40	RIC	9.5	IN			
05/03/18	9:40	RIC	15	IN	19.18	273	27.9
05/09/18	9:30	RIC	11.25	IN	14.38	263	32.5
05/16/18	10:25	RIC	6.00	IN	5.88	186	18.5
05/23/18	10:00	RIC	2.00	IN	2.53	151	14.5
05/30/18	9:50	RIC	0.00	IN	1.85	147	24.3
06/06/18	11:10	RIC			1.57	145	8.8
06/20/18	15:25	RIC			0.98	116	9.3
06/27/18	12:15	RIC			0.81	108	6.5
07/11/18	12:20	RIC			0.37	87.4	6.1
03/24/18	14:30	SEL	7.00	IN	5.40	808	56.6
04/02/18	16:30	SEL	8	IN	4.27	589	38.2

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity	Total Nitrogen	Total Phosphorus
				units	NTU	ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
04/08/18	14:55	SEL	6.75	IN	3.37	538	50.4
04/17/18	12:38	SEL	15	IN	5.18	551	54.1
04/26/18	15:50	SEL	20.5	IN	5.28	469	65.9
05/02/18	8:40	SEL	19.5	IN	4.72	397	51.1
05/08/18	15:10	SEL	18.50	IN	4.94	335	48.9
05/17/18	12:10	SEL	13.50	IN	3.70	312	35.9
05/22/18	9:04	SEL	11.00	IN	2.79	354	33.4
05/28/18	11:35	SEL	7.75	IN	2.34	343	35.8
06/04/18	10:30	SEL	7.25	IN	5.49	358	31.5
06/17/18	12:30	SEL	4.75	IN	2.05	279	24
06/26/18	8:40	SEL	4.00	IN	2.06	290	27.9
07/01/18	15:30	SEL	3.25	IN	2.50	265	24.9
03/08/18	13:30	SWP			0.32	260	2.5
03/24/18	14:20	SWP			0.47	820	4.4
04/02/18	14:55	SWP			0.22	669	7.1
04/11/18	11:45	SWP			0.55	666	13.1
04/17/18	15:35	SWP			0.52	898	8.6
04/26/18	11:05	SWP	10.75	IN	0.64	834	16.9
05/03/18	11:15	SWP	10.75	IN	0.57	389	11.6
05/08/18	11:00	SWP	13.50	IN	0.96	502	22.7
05/17/18	11:05	SWP	13.75	IN	0.86	317	16.6
05/22/18	10:14	SWP	13.50	IN	0.99	210	12.1
05/28/18	12:40	SWP	13.50	IN	0.54	196	15.6
06/04/18	11:20	SWP	12.50	IN	0.47	156	11.9
06/17/18	13:20	SWP	10.00	IN	0.54	190	12
06/26/18	9:50	SWP	9.50	IN	0.61	170	10.3
07/01/18	16:26	SWP	9.00	IN	0.76	162	10.3
03/05/18	13:46	TRL			0.30	453	5.2
03/24/18	12:39	TRL			0.75	1110	24.9
04/02/18	13:25	TRL			0.34	876	25.9
04/11/18	10:25	TRL			0.79	951	38.8
04/17/18	14:15	TRL			1.77	957	77.6
04/26/18	10:15	TRL	27	IN	4.03	625	65.4
05/03/18	10:05	TRL	26.25	IN	2.88	438	43.2
05/08/18	10:25	TRL	33.00	IN	10.37	447	53
05/17/18	11:30	TRL	35.50	IN	9.88	339	41.6
05/22/18	9:40	TRL	33.50	IN	6.46	240	29.7

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen ug/L-N MDL: 25.0	Total Phosphorus ug/L-P MDL: 1.5
05/28/18	12:10	TRL	34.00	IN	8.58	252	40.5
06/04/18	10:55	TRL	30.50	IN	3.05	167	18.1
06/17/18	13:00	TRL	22.75	IN	1.51	121	11.5
06/26/18	9:30	TRL	21.00	IN	1.80	123	10.7
07/01/18	16:03	TRL	19.50	IN	1.23	107	11.8
05/03/18	16:50	TRL @ hs			7.57		
07/18/18	14:00	TRL @ hs			1.72		
04/05/18	10:50	UCL			2.51	184	9.7
04/12/18	8:40	UCL			4.64	199	11.4
04/20/18	9:10	UCL			3.93	209	11.1
04/25/18	9:00	UCL			3.54	209	11
05/03/18	9:30	UCL			5.79	214	13.4
05/09/18	9:20	UCL			7.29	194	14.7
05/16/18	10:15	UCL	5.14	FT	5.30	147	10.9
05/23/18	9:45	UCL	4.72	FT	3.34	118	10
05/30/18	9:40	UCL	4.22	FT	2.70	116	9.2
06/06/18	10:55	UCL	3.00	FT	1.88	115	7.4
06/20/18	15:15	UCL	1.75	FT	1.79	102	7
06/27/18	12:05	UCL	1.70	FT	1.24	101	5.4
07/11/18	12:10	UCL	1.10	FT	0.74	92.8	5
04/17/18	9:30	UHL			5.62	201	24
04/23/18	9:00	UHL			5.24	166	20.5
04/30/18	8:25	UHL	12.25	IN	10.70	184	39.5
05/04/18	12:30	UHL			5.47	141	26.4
05/11/18	13:20	UHL	12.25	IN	4.81	124	32.7
05/18/18	12:40	UHL	7.25	IN	3.15	110	29.7
05/25/18	12:25	UHL	14.25	IN	1.36	107	26.3
06/01/18	12:10	UHL	11.00	IN	1.51	126	24
06/08/18	12:20	UHL	8.25	IN	1.10	114	22.5
06/22/18	12:15	UHL	5.25	IN	0.80	108	22.8
06/29/18	11:55	UHL	3.75	IN	0.83	83.8	19.4
07/13/18	12:25	UHL	3.25	IN	1.31	78.3	20.2
05/12/18	12:55	WFC			4.59	127	12.6
05/16/18	9:50	WFC			4.44	116	11
05/23/18	9:30	WFC			3.57	86	7.2
05/30/18	9:20	WFC			2.60	81.1	8.2

Appendix B 2018 (continued)

Date	Time	Site Code	Gage	Gage units	Turbidity NTU	Total Nitrogen	Total Phosphorus
						ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
06/06/18	10:40	WFC			1.80	89.1	6.4
06/20/18	15:05	WFC			1.29	72.8	4.5
06/27/18	11:50	WFC			1.10	70.2	4.2
07/11/18	12:00	WFC			0.51	58.7	2.5

2019 Figures

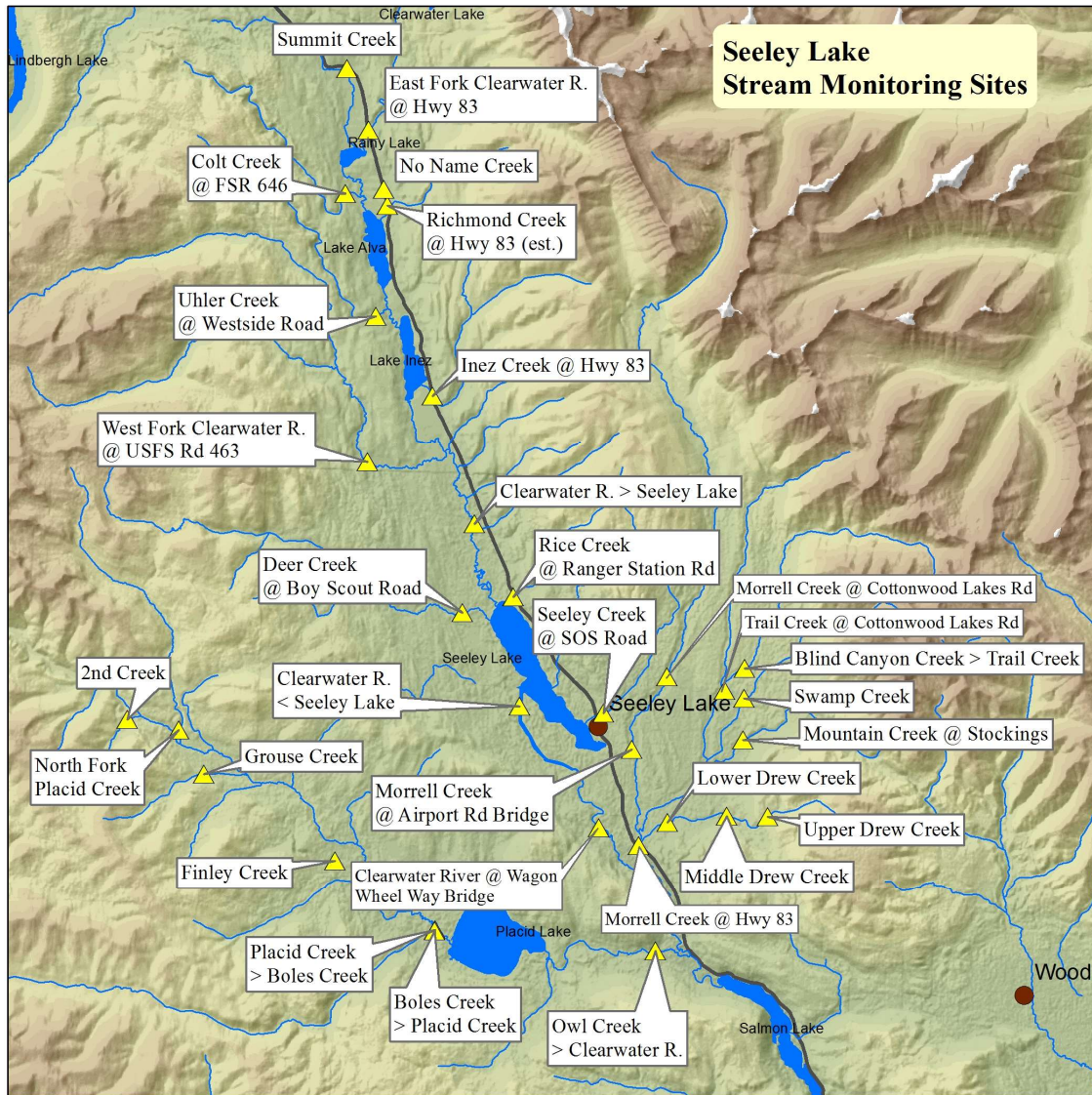


Figure 1. Sample Sites for 2019. Note that Summit Creek on the map should be Bertha and is identified as BER in the data set and Appendix A, as well as Inez Creek should be Camp Creek and is identified as CMP in the data set and Appendix A.

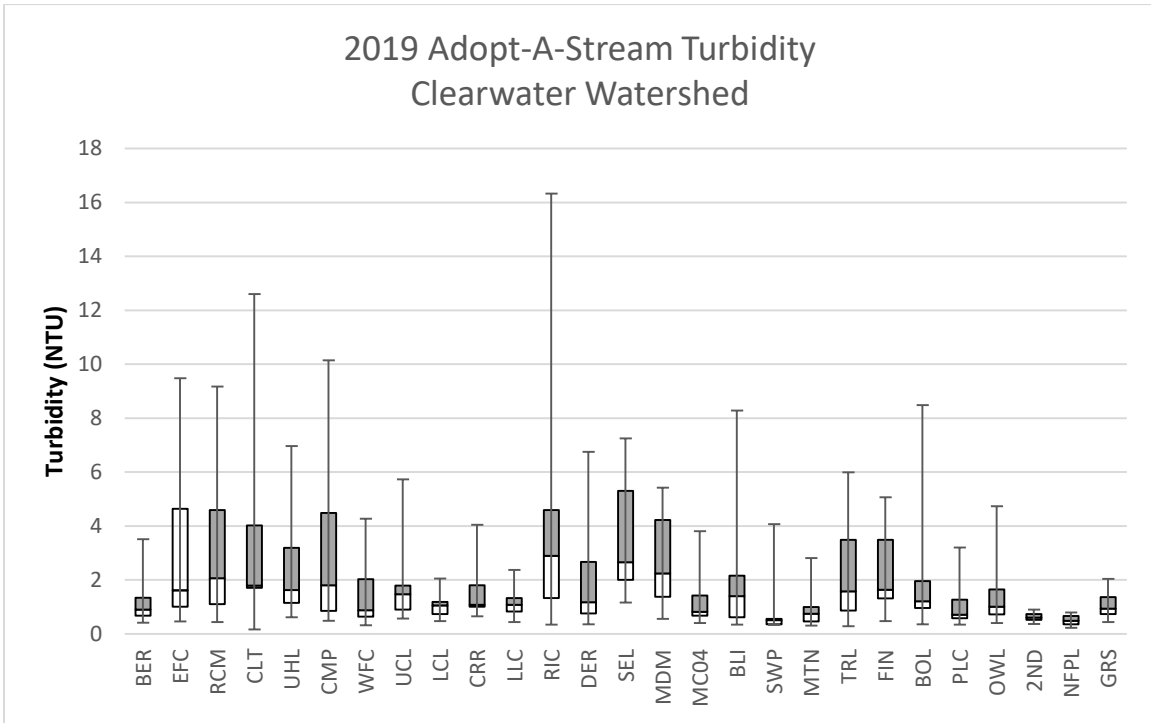


Figure 2. Turbidity in 27 sites in the Clearwater Basin, mid-March through June 2019. The vertical lines show the range of samples. The tops/bottoms of the bars show the 25th, 50th (median), and 75th quartiles. The codes for stream names are in Appendix A.

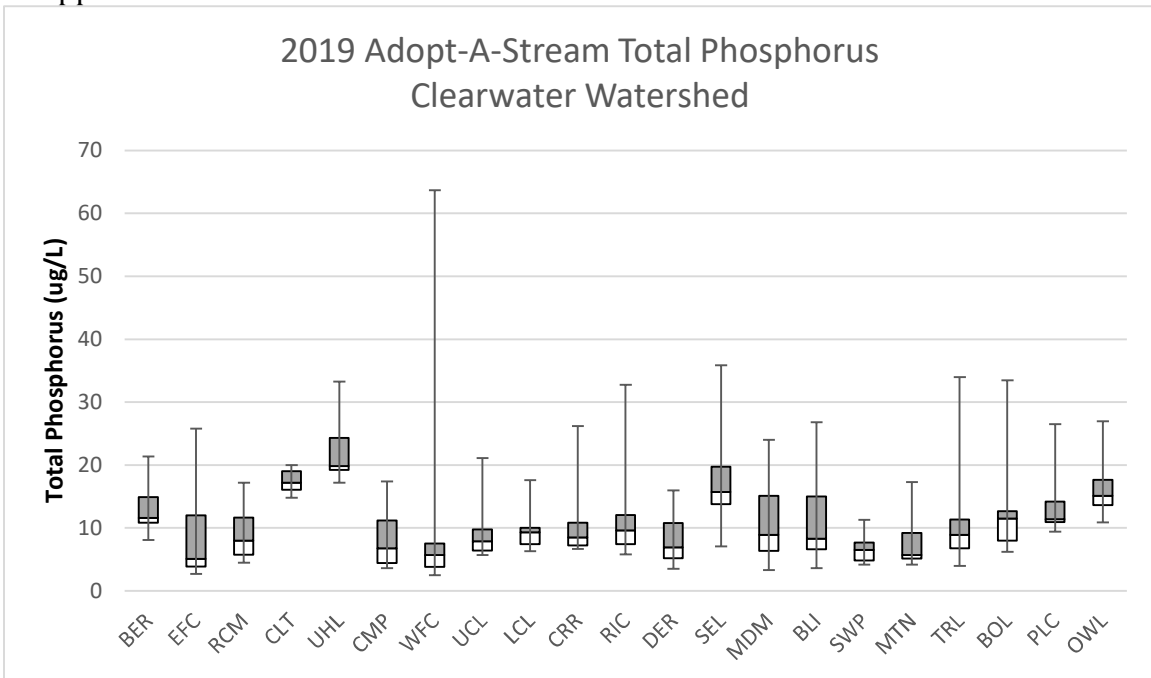


Figure 3. Total phosphorus in 21 sites in the Clearwater Basin, March through June 2019. The vertical lines show the range of samples. The tops/bottoms of the bars show the 25th, 50th (median), and 75th quartiles. The codes for stream names are in Appendix A.

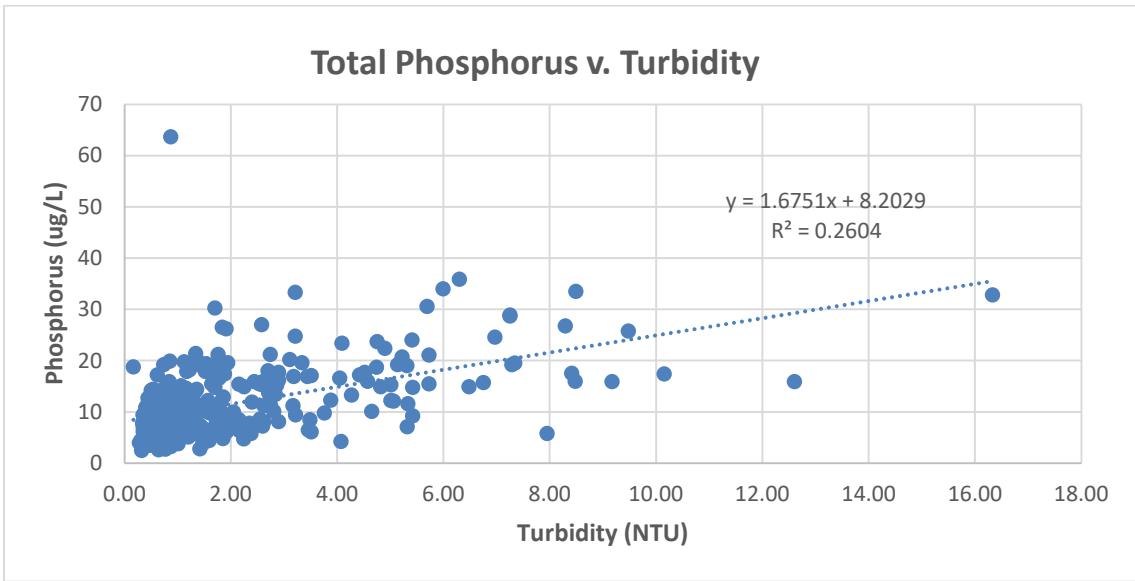


Figure 4. Associations of total phosphorous with turbidity across all sites sampled in the Clearwater Basin during runoff in 2019.

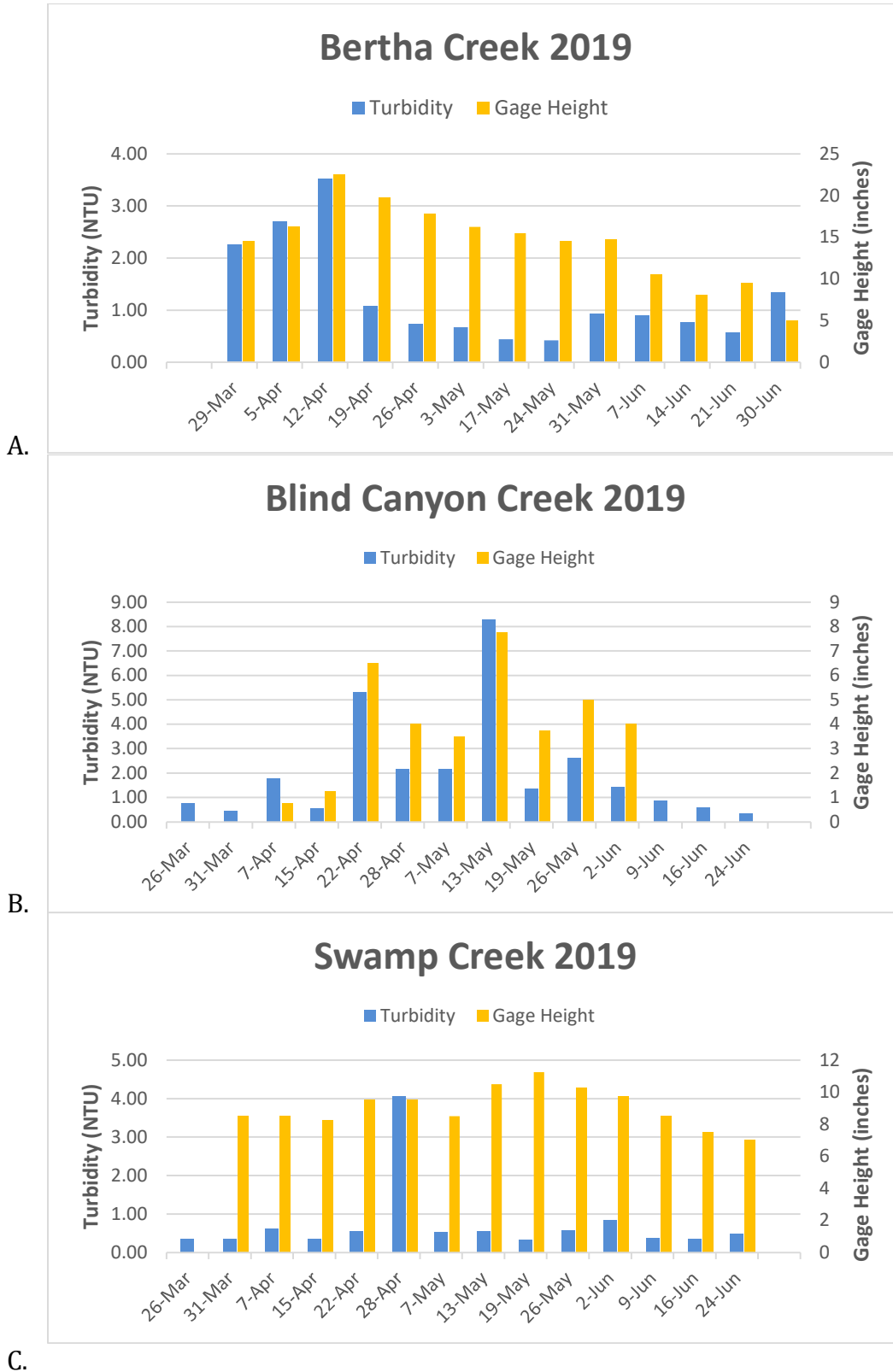


Figure 5. Associations of total phosphorous with turbidity in three sites (A=BER, B=BLI, C=SWP) sampled in the Clearwater Basin during runoff in 2018.

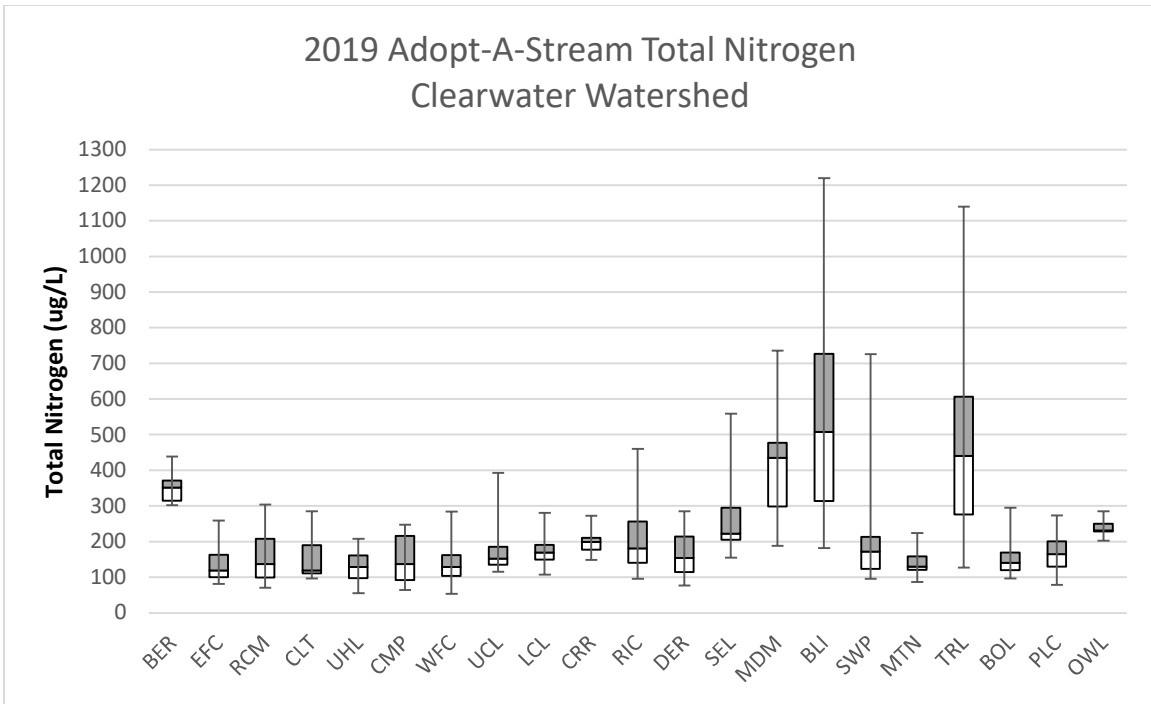


Figure 6. Total nitrogen in 21 sites in the Clearwater Basin, March through June 2019. The vertical lines show the range of samples. The tops/bottoms of the bars show the 25th, 50th (median), and 75th quartiles. The codes for stream names are in Appendix A.

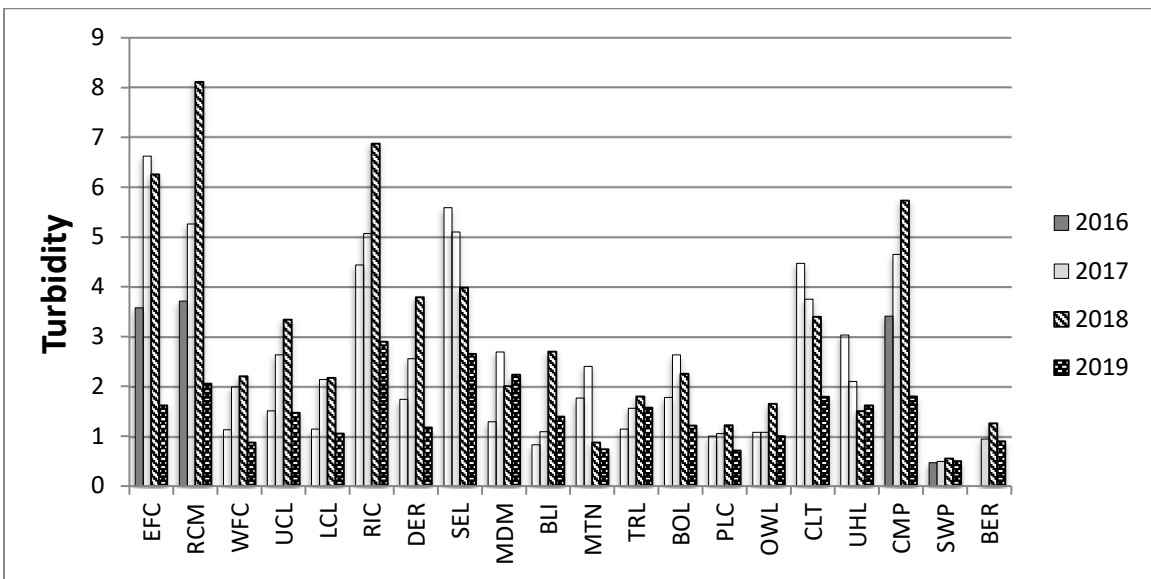


Figure 7. Median turbidity in 20 sites in the Clearwater Basin sampled from mid March through June in 2016, 2017, 2018, and 2019. Bertha (BER) was not sampled in 2016.

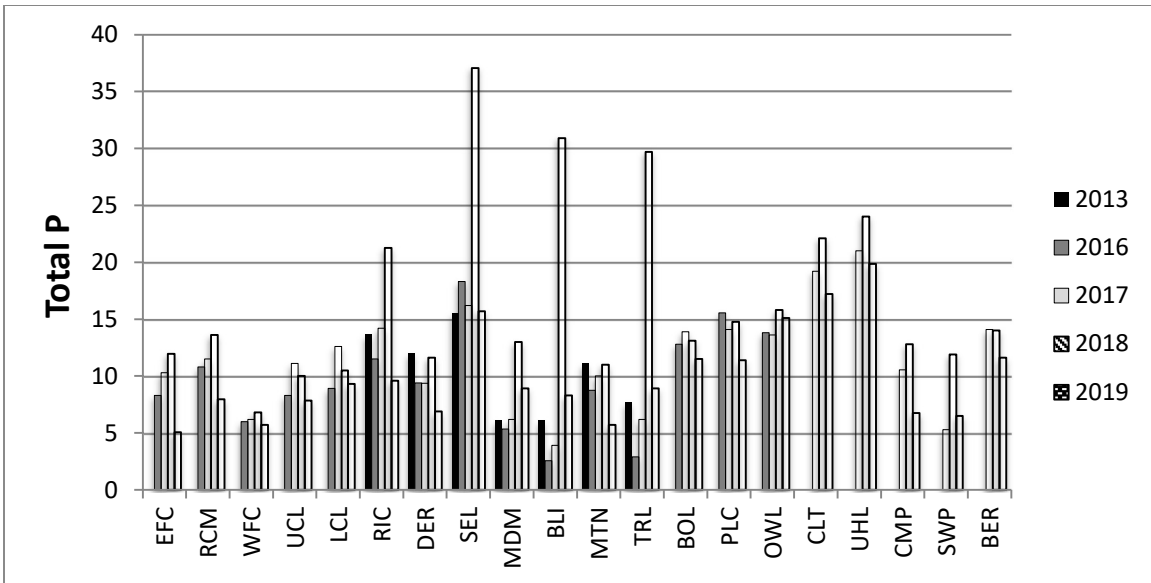


Figure 8. Median total P in 20 sites in the Clearwater Basin sampled from mid March through June in 2016, 2017, 2018 and 2019, including 7 sites also sampled in 2013. CLT, UHL, CMP, SWP, and BER were not sampled in 2016.

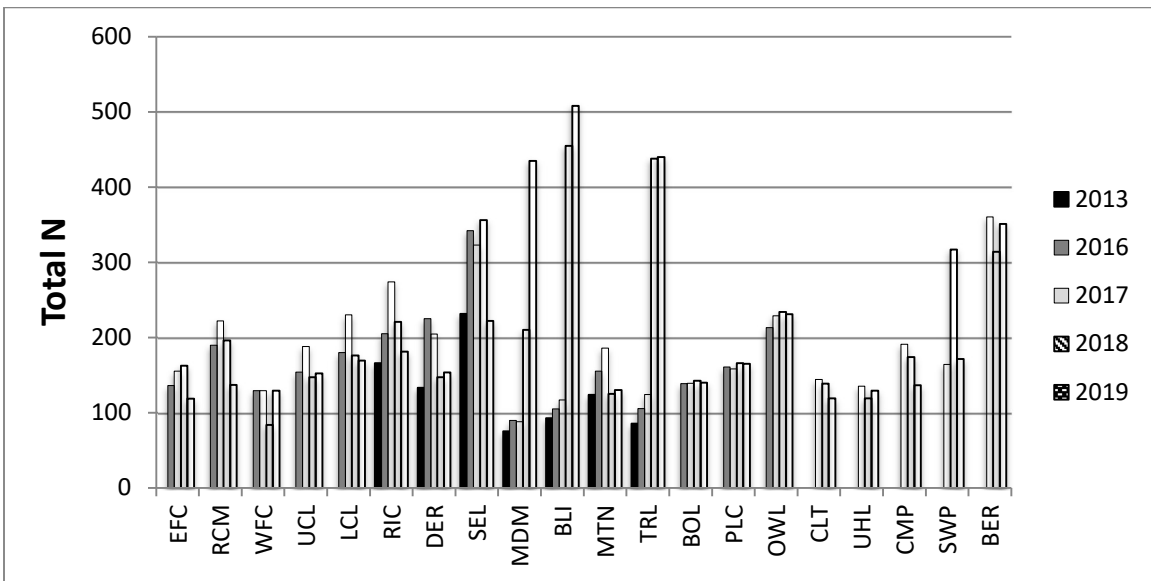


Figure 9. Median total N in 20 sites in the Clearwater Basin sampled from mid March through June in 2016, 2017, 2018 and 2019, including 7 sites also sampled in 2013. CLT, UHL, CMP, SWP, and BER were not sampled in 2016.

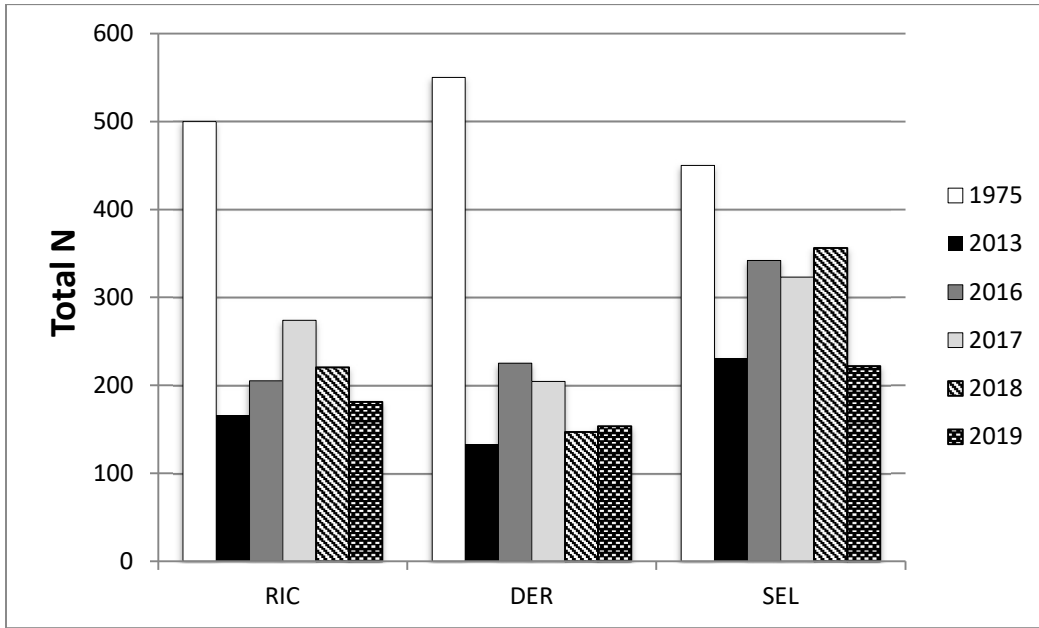


Figure 10. Median total N in three streams (RIC, DER, SEL) sampled in 1975, 2013, 2016, 2017, 2018, and 2019.

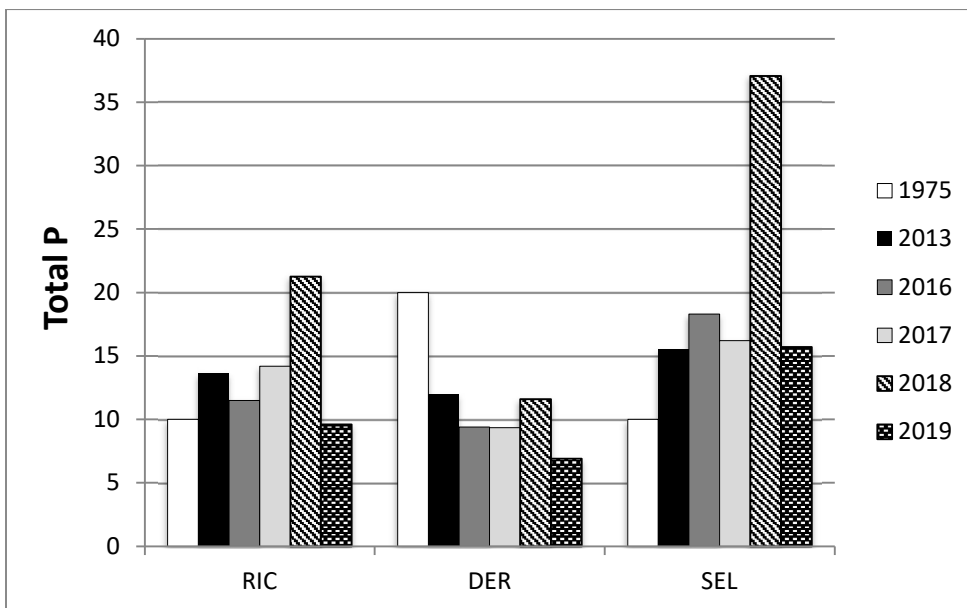


Figure 11. Median total P in three streams (RIC, DER, SEL) sampled in 1975, 2013, 2016, 2017, 2018, and 2019.

Appendices 2019

Appendix A 2019. Sampling sites for Clearwater Basin water quality in 2019. Tier 1 streams were also sampled in 2013. Tier 1, tier 2 and tier 3 streams were sampled weekly throughout the runoff and included stage, turbidity, total nitrogen and total phosphorus. Tier 4 streams were sampled only for turbidity; and some were sampled only occasionally.

Site Name	Site Code	Latitude °N	Longitude °W	Elevation (ft)	Drainage Area (km ²)	Mean Annual Flow (cfs)	Mean Summer Flow (cfs)	Mean August Flow (cfs)
Tier 1: Prior AAS sites								
Morrell Creek @ Cottonwood Lakes Rd	MDM	47.19403	-113.45562	4194	68.39	40.47	57.22	19.19
Trail Creek @ Cottonwood Lakes Road	TRL	47.19064	-113.43141	4265	40.01	19.94	23.56	7.45
Blind Canyon Creek > Trail Creek	BLI	47.19705	-113.42330	4281	23.88	12.23	14.29	4.50
Deer Creek @ Boy Scout Road	DER	47.21035	-113.54176	4042	51.70	25.14	19.34	7.99
Seeley Creek @ SOS Road	SEL	47.18307	-113.48162	4124	13.51	2.98	2.35	1.85
Mountain Creek @ Stockings	MTN	47.17679	-113.42311	4386	16.88	5.40	5.07	2.46
Rice Creek @ Ranger Station Rd	RIC	47.21526	-113.52072	4065	7.38	1.50	1.24	0.92
Swamp Creek	SWP	47.18862	-113.42317	4333	12.12	5.87	6.72	2.20
Tier 2: Major Tributaries								
East Fork Clearwater R. @ Hwy 83	EFC	47.34684	-113.58779	4180	45.15	28.11	26.10	9.37
West Fork Clearwater R. @ USFS Rd 463	WFC	47.25227	-113.58351	4153	87.65	65.41	60.77	16.76
Richmond Creek @ Hwy 83 (est.)	RCM	47.32545	-113.57875	4239	5.02	1.91	1.61	0.77
Placid Creek > Boles Creek	PLC	47.11986	-113.54896	4137	128.16	64.79	52.60	20.89
Boles Creek > Placid Creek	BOL	47.11953	-113.54912	4136	51.52	34.60	26.67	9.08
Owl Creek > Clearwater R. (est.)	OWL	47.11589	-113.45695	3953	235.89	110.90	87.32	36.11
Clearwater R. < Seeley Lake	LCL	47.18433	-113.51684	4012 ¹	385.29	171.64	145.36	59.13
Clearwater R. > Seeley Lake	UCL	47.23570	-113.53805	4045	258.31	131.57	113.95	42.14
Clearwater R. @ Riverview Bridge ²	CRR	47.16547	-113.49073	4006				

¹ Corrected elevation from 3960' to 4012'.

² Added this site in 2018 for consideration as alternate to LCL due to dangerous sampling conditions at LCL.

Appendix A 2019 (continued)

Site Name	Site Code	Latitude °N	Longitude °W	Elevation (ft)	Drainage Area (km ²)	Mean Annual Flow (cfs)	Mean Summer Flow (cfs)	Mean August Flow (cfs)
Tier 3: Tribs w/ lot of USFS and/or activity								
Camp Creek @ Hwy 83	CMP	47.27176	-113.55724	4150	28.64	9.83	8.40	4.27
Uhler Creek @ Westside Road	UHL	47.29386	-113.58204	4203	8.49	2.99	1.59	1.02
Colt Creek @ FSR 646	CLT	47.32857	-113.59657	4474	10.20	4.08	2.06	1.29
Bertha Creek @ Summit Park Rd	BER	47.36367	-113.59835	4110	13.68	4.23	2.39	1.60
Tier 4: Other interesting tributaries or sites, turbidities only								
Finley Creek	FIN	47.13879	-113.59158	4280	5.41	1.63	1.04	0.68
North Fork Placid Creek	NFP	47.17440	-113.65852	4652	25.79	24.02	28.16	6.78
Grouse Creek	GRS	47.16216	-113.64738	4605	6.85	3.18	1.82	1.06
2nd Creek	2ND	47.17694	-113.68010	4890	7.99	5.34	2.82	1.32
Clearwater R. @ Wagon Wheel Way Bridge	LLC	47.15060	-113.48213	3960	394.57	173.19	146.68	60.21
Morrell Creek @ Hwy 83	MC04	47.14579	-113.46528	3976	159.17	40.47	57.22	19.19

Appendix B 2019. Clearwater Valley Water Quality Data collected in 2019. Gage represents water depth either on a temporary staff installed at the sampling site or on a permanent gage. Negative values represent water levels that fell below the bottom of the gage and were measured from that point with a hand held ruler.

Date	Time	Site Code	Gage	Gage	Turbidity NTU	Total Nitrogen	Total Phosphorus
				units		ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
3/20/2019	10:15	BOL	7.00	IN	0.36	141	6.7
3/20/2019	10:30	PLC	12.75	IN	0.52	79.2	11.4
3/20/2019	11:00	OWL	17.00	IN	0.50	243	14.2
3/21/2019	10:40	FIN			3.81		
3/21/2019	11:00	GRS			1.65		
3/21/2019	11:30	NFPL			0.32		
3/21/2019	11:50	2ND			0.80		
3/21/2019	13:15	MC04	0.34	FT	0.41		
3/21/2019	13:20	LLC	7.00	IN	0.44		
3/22/2019	11:15	EFC	12.00	IN	0.46	103	12.1
3/22/2019	11:45	RCM	5.00	IN	0.44	87.9	6.8
3/22/2019	12:10	UHL			1.70	153	30.3
3/26/2019	8:30	MTN			0.72	134	6.2
3/26/2019	9:55	TRL	17.50	IN	0.88	573	11.4
3/26/2019	10:30	BLI	0.00	IN	0.76	652	7.3
3/26/2019	11:00	SWP			0.35	200	9.4
3/26/2019	12:20	SEL	3.50	IN	6.30	559	35.9
3/26/2019	12:40	MDM	0.28	FT	2.86	493	15.2
3/22/2019	12:30	CMP	9.50	IN	0.49	114	7.3
3/27/2019	11:00	BOL	5.50	IN	1.21	121	9.2
3/27/2019	11:10	PLC	23.50	IN	1.84	210	26.5
3/27/2019	11:30	OWL	21.50	IN	0.80	230	15.5
3/28/2019	13:10	CRR			0.72	149	6.7
3/28/2019	13:20	LCL			0.58		
3/28/2019	13:30	DER	1.40	FT	2.75	199	11.2
3/28/2019	13:40	UCL	0.90	FT	1.22	134	7.5
3/28/2019	13:50	RIC			1.84	246	9.8
3/28/2019	9:35	FIN			3.76		
3/28/2019	10:07	GRS			1.91		
3/28/2019	10:27	NFPL			0.47		
3/28/2019	10:41	2ND			0.62		
3/28/2019	12:22	MC04	0.63	FT	0.63		
3/28/2019	12:30	LLC	9.50	IN	0.58		

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity NTU	Total Nitrogen	Total Phosphorus
				units		ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
3/29/2019	11:55	BER	14.50	IN	2.25	343	14.9
3/29/2019	12:10	EFC	14.50	IN	1.59	111	4.4
3/29/2019	12:25	RCM	6.00	IN	1.71	122	7.4
3/29/2019	12:45	UHL	8.50	IN	3.21	171	33.3
3/29/2019	13:00	CMP	10.00	IN	2.03	142	7.5
3/31/2019	13:15	MTN			0.43	126	5.1
3/31/2019	17:40	SEL	3.75	IN	5.32	218	7.1
3/31/2019	17:05	MDM	0.30	FT	1.92	325	6.7
3/31/2019	16:25	TRL	16.50	IN	0.71	383	8.0
3/31/2019	15:45	BLI	0.00	IN	0.46	497	8.1
3/31/2019	15:00	SWP	8.50	IN	0.35	218	7.1
4/3/2019	9:40	FIN			5.07		
4/3/2019	10:13	GRS			2.04		
4/3/2019	10:30	NFPL			0.66		
4/3/2019	10:45	2ND			0.71		
4/3/2019	12:10	MC04	0.78	FT	1.95		
4/3/2019	12:15	LLC	12.75	IN	1.32		
4/3/2019	10:10	PLC	26.00	IN	2.74	219	21.2
4/3/2019	10:20	BOL	9.50	IN	2.40	133	11.9
4/3/2019	10:45	OWL	27.00	IN	1.52	212	17.9
4/3/2019	13:20	WFC			2.38	129	5.8
4/4/2019	10:30	RIC	6.25	IN	4.82	300	14.9
4/4/2019	10:40	UCL	1.10	FT	1.58	150	9.9
4/4/2019	10:50	DER			4.57	272	16.0
4/4/2019	11:10	CRR			1.42	206	10.8
4/5/2019	11:40	LCL			1.14	191	9.5
4/5/2019	11:05	BER	16.25	IN	2.70	351	18.0
4/5/2019	11:20	EFC	18.50	IN	8.41	199	17.5
4/5/2019	11:30	RCM	8.00	IN	5.73	245	15.5
4/5/2019	11:50	UHL	10.25	IN	5.69	208	30.6
4/5/2019	12:05	CMP	12.75	IN	6.48	233	14.9
4/7/2019	12:10	MTN	4.50	IN	1.16	217	14.6
4/7/2019	12:35	SEL	7.50	IN	7.25	422	28.7
4/7/2019	15:40	MDM	0.70	FT	4.52	484	17.7
4/7/2019	14:55	TRL	19.75	IN	4.90	549	22.4
4/7/2019	14:25	BLI	0.75	IN	1.76	634	21.2
4/7/2019	13:55	SWP	8.50	IN	0.62	726	11.3
4/10/2019	9:35	FIN			4.43		

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity NTU	Total Nitrogen	Total Phosphorus
				units		ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
4/10/2019	10:47	MC04	1.36	FT	1.46		
4/10/2019	10:55	LLC	27.50	IN	2.37		
4/10/2019	9:40	WFC			4.27	221	13.3
4/10/2019	12:00	PLC	>36.0	IN	3.21	274	24.8
4/10/2019	12:10	BOL	22.50	IN	8.49	295	33.5
4/10/2019	12:45	OWL	>36.0	IN	2.58	280	27.0
4/10/2019	13:00	CRR			4.05	273	16.6
4/10/2019	13:10	LCL			2.05	184	10.0
4/10/2019	13:25	DER	2.50	FT	6.75	285	15.7
4/10/2019	13:30	UCL	2.50	FT	5.73	393	21.1
4/10/2019	13:40	RIC	11.25	IN	16.33	460	32.8
4/12/2019	10:00	CLT	7.25	IN	12.60	285	15.9
4/12/2019	10:15	BER	22.50	IN	3.51	315	17.1
4/12/2019	10:30	EFC	23.50	IN	8.48	215	16.0
4/12/2019	10:45	RCM	10.75	IN	9.17	285	15.9
4/12/2019	11:00	UHL	11.00	IN	6.97	197	24.6
4/12/2019	11:15	CMP	16.25	IN	10.15	248	17.4
4/15/2019	11:30	MTN	6.75	IN	0.97	164	10.3
4/15/2019	12:10	SEL	8.00	IN	5.22	310	20.7
4/15/2019	13:26	SWP	8.25	IN	0.34	369	7.8
4/15/2019	14:00	BLI	1.25	IN	0.54	383	14.4
4/15/2019	14:35	TRL	20.00	IN	0.98	320	10.7
4/15/2019	15:20	MDM	0.60	FT	1.48	332	6.7
4/17/2019	9:30	WFC			1.22	152	7.5
4/17/2019	10:10	UCL	2.10	FT	1.71	208	9.1
4/17/2019	10:15	RIC	6.00	IN	7.95	136	5.8
4/17/2019	10:50	LCL			1.06	148	7.9
4/17/2019	11:00	DER	2.00	FT	3.76	223	9.8
4/17/2019	11:30	CRR			1.91	261	26.2
4/17/2019	12:00	PLC	30.50	IN	1.18	218	14.0
4/17/2019	12:05	BOL	13.00	IN	2.84	156	13.4
4/17/2019	12:15	OWL	35.00	IN	1.88	285	17.4
4/17/2019	11:53	FIN			3.20		
4/17/2019	13:10	MC04	1.10	FT	1.38		
4/17/2019	13:25	LLC	26.00	IN	1.00		
4/18/2019	9:45	CLT	7.00	IN	7.29	198	19.2
4/19/2019	10:40	BER	19.75	IN	1.08	304	13.1
4/19/2019	10:55	EFC	24.00	IN	5.33	171	11.6

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity	Total Nitrogen	Total Phosphorus
				units	NTU	ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
4/19/2019	11:10	RCM	10.50	IN	4.42	304	17.2
4/19/2019	11:35	UHL	17.00	IN	3.11	164	20.2
4/19/2019	11:50	CMP	17.50	IN	5.01	231	15.3
4/22/2019	11:50	MTN	9.50	IN	2.75	224	17.3
4/22/2019	12:50	TRL	27.25	IN	5.99	1140	34.0
4/22/2019	13:20	BLI	6.50	IN	5.31	1220	19.0
4/22/2019	13:55	SWP	9.50	IN	0.54	328	8.3
4/22/2019	15:00	SEL	12.50	IN	7.25	351	28.9
4/22/2019	15:28	MDM	1.30	FT	5.41	736	24.0
4/24/2019	9:00	RIC	13.00	IN	7.34	311	19.5
4/24/2019	10:00	WFC			2.02	162	7.5
4/24/2019	10:25	DER	2.70	FT	1.20	219	11.1
4/24/2019	10:30	LCL			1.62	177	9.7
4/24/2019	11:15	BOL	26.00	IN	3.18	182	16.9
4/24/2019	11:20	PLC	>36.0	IN	1.36	191	14.4
4/24/2019	11:40	OWL	>36.0	IN	1.76	256	20.0
4/25/2019	9:40	CLT	11.50	IN	5.14	198	19.2
4/25/2019	10:20	UCL	2.83	FT	1.94	233	19.6
4/25/2019	12:53	FIN			2.90		
4/25/2019	14:00	MC04	1.74	FT	2.62		
4/25/2019	14:15	LLC	36.00	IN	1.07		
4/26/2019	12:50	BER	17.75	IN	0.73	302	10.8
4/26/2019	1:05	EFC	30.00	IN	2.54	139	8.0
4/26/2019	1:20	RCM	11.75	IN	5.06	210	12.1
4/26/2019	1:35	UHL	22.25	IN	4.09	141	23.4
4/26/2019	1:50	CMP	21.50	IN	5.01	234	12.2
4/28/2019	11:57	MTN	9.25	IN	2.81	160	10.1
4/28/2019	12:26	SEL	8.50	IN	1.64	217	15.5
4/28/2019	13:30	SWP	9.50	IN	4.07	187	4.2
4/28/2019	14:00	BLI	4.00	IN	2.15	752	8.5
4/28/2019	14:30	TRL	23.25	IN	3.49	617	8.5
4/28/2019	15:21	MDM	0.95	FT	5.42	441	9.2
5/1/2019	12:15	FIN			2.00		
5/1/2019	12:37	GRS			0.99		
5/1/2019	12:50	NFPL			0.50		
5/1/2019	13:10	2ND			0.58		
5/1/2019	14:35	MC04	1.18	FT	0.73		
5/1/2019	14:43	LLC	27.50	IN	1.67		

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity NTU	Total Nitrogen	Total Phosphorus
				units		ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
5/1/2019	9:52	BOL	17.75	IN	1.17	270	17.9
5/1/2019	9:55	PLC	>36.0	IN	0.64	176	11.1
5/1/2019	10:17	OWL	>36.0	IN	4.74	228	18.7
5/2/2019	8:28	CRR			1.80	203	9.9
5/2/2019	8:45	LCL			0.77	108	9.3
5/2/2019	8:51	DER	1.80	FT	1.20	147	6.7
5/2/2019	9:06	WFC			0.74	226	5.4
5/2/2019	9:19	UCL	2.15	FT	1.79	164	10.2
5/2/2019	9:38	RIC	8.75	IN	3.88	194	12.3
5/3/2019	10:30	BER	16.25	IN	0.67	307	8.7
5/3/2019	10:45	EFC			1.48	117	4.8
5/3/2019	11:05	RCM	8.50	IN	4.65	171	10.1
5/3/2019	11:25	CLT	10.00	IN	2.90	162	16.2
5/3/2019	11:45	UHL	17.00	IN	2.90	123	17.7
5/3/2019	12:00	CMP	16.50	IN	2.90	148	8.1
5/7/2019	8:45	MTN	6.25	IN	0.42	142	6.5
5/7/2019	9:30	SEL	5.50	IN	2.71	201	13.7
5/7/2019	9:45	MDM	0.86	FT	1.20	457	5.1
5/7/2019	9:55	TRL	22.25	IN	3.46	686	6.5
5/7/2019	10:10	BLI	3.50	IN	2.15	789	6.4
5/7/2019	10:30	SWP	8.50	IN	0.52	121	4.9
5/8/2019	10:10	FIN			1.63		
5/8/2019	10:45	GRS			1.11		
5/8/2019	11:07	NFPL			0.57		
5/8/2019	11:22	2ND			0.71		
5/8/2019	12:25	MC04	1.32	FT	0.81		
5/8/2019	12:32	LLC	24.50	IN	1.57		
5/8/2019	9:30	RIC	9.25	IN	3.22	202	9.4
5/8/2019	10:45	UCL	2.30	FT	1.77	167	9.4
5/8/2019	11:00	WFC			0.83	104	5.3
5/8/2019	11:25	DER	2.15	FT	1.15	160	6.5
5/8/2019	11:35	LCL			1.19	169	10.6
5/8/2019	12:00	CRR			1.80	210	11.8
5/8/2019	12:40	BOL	20.00	IN	1.09	153	11.8
5/8/2019	12:45	PLC	33.25	IN	0.71	147	12.5
5/8/2019	13:15	OWL	30.50	IN	0.84	231	15.9
5/13/2019	17:00	MTN	7.25	IN	0.81	125	5.5
5/13/2019	17:25	SEL	3.75	IN	3.44	239	16.9

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity NTU	Total Nitrogen	Total Phosphorus
				units		ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
5/13/2019	17:40	MDM	1.38	FT	5.42	589	14.8
5/13/2019	17:50	TRL	30.00	IN	4.75	850	23.7
5/13/2019	18:00	BLI	7.75	IN	8.29	979	26.8
5/13/2019	18:10	SWP	10.50	IN	0.55	163	7.2
5/15/2019	9:50	RIC	7.50	IN	2.62	168	8.1
5/15/2019	10:00	UCL	3.20	FT	2.16	154	8.2
5/15/2019	10:15	WFC			2.35	143	7.8
5/15/2019	10:40	DER	2.35	FT	2.39	160	7.1
5/15/2019	11:00	LCL			1.07	205	11.3
5/15/2019	13:15	CRR			1.07	177	7.2
5/15/2019	11:20	OWL	36.00	IN	0.89	250	14.1
5/15/2019	11:50	PLC	35.00	IN	0.90	153	10.7
5/15/2019	11:45	BOL	21.00	IN	1.35	140	11.5
5/15/2019	9:50	FIN			1.54		
5/15/2019	10:15	GRS			1.27		
5/15/2019	10:25	NFPL			0.66		
5/15/2019	10:35	2ND			0.90		
5/15/2019	11:50	MC04	2.10	FT	3.81		
5/15/2019	12:00	LLC	30.00	IN	1.12		
5/17/2019	11:45	BER	15.50	IN	0.44	439	12.7
5/17/2019	12:00	EFC	24.00	IN	9.48	259	25.8
5/17/2019	12:10	RCM	9.50	IN	1.86	201	8.5
5/17/2019	12:35	CLT	11.00	IN	2.15	181	15.4
5/17/2019	12:50	UHL	19.50	IN	1.22	135	18.2
5/17/2019	13:10	CMP	19.00	IN	1.75	169	6.2
5/19/2019	11:35	MTN	10.00	IN	0.39	155	5.4
5/19/2019	12:00	SEL	5.50	IN	2.54	249	15.5
5/19/2019	12:10	MDM	1.18	FT	1.57	453	12.2
5/19/2019	12:25	TRL	26.50	IN	0.86	457	9.3
5/19/2019	12:30	BLI	3.75	IN	1.35	519	9.3
5/19/2019	12:45	SWP	11.25	IN	0.33	180	4.3
5/23/2019	8:55	OWL	5.50	IN	0.65	250	14.1
5/23/2019	9:24	PLC	8.75	IN	0.67	182	10.4
5/23/2019	9:30	BOL			0.98	235	10.8
5/23/2019	10:04	CRR			1.02	218	8.7
5/23/2019	10:20	LCL			0.72	140	7.8
5/23/2019	10:29	DER	1.90	FT	0.77	138	8.2
5/23/2019	10:50	WFC			0.64	114	2.6

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity NTU	Total Nitrogen	Total Phosphorus
				units		ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
5/23/2019	11:10	UCL	2.25	FT	0.87	191	6.2
5/23/2019	11:17	RIC	7.75	IN	3.17	260	11.2
5/23/2019	9:10	FIN			1.33		
5/23/2019	9:30	GRS			0.86		
5/23/2019	9:40	NFPL			0.80		
5/23/2019	9:50	2ND			0.47		
5/23/2019	11:48	MC04	1.28	FT	0.68		
5/23/2019	11:55	LLC	27.50	IN	0.85		
5/24/2019	11:40	BER	14.50	IN	0.42	343	8.1
5/24/2019	11:55	EFC	13.50	IN	1.64	135	5.3
5/24/2019	12:10	RCM	8.75	IN	3.51	147	6.1
5/24/2019	12:25	CLT	10.50	IN	1.70	107	14.8
5/24/2019	12:40	UHL	16.75	IN	1.54	121	19.4
5/24/2019	12:55	CMP	16.25	IN	1.85	131	4.8
5/26/2019	14:15	MTN	8.50	IN	0.76	121	4.9
5/26/2019	15:05	SEL	3.25	IN	2.44	220	15.9
5/26/2019	15:15	MDM	1.25	FT	3.34	429	19.6
5/26/2019	15:30	TRL	21.00	IN	2.62	423	11.2
5/26/2019	15:35	BLI	5.00	IN	2.61	474	15.2
5/26/2019	14:50	SWP	10.25	IN	0.56	130	4.6
5/30/2019	9:05	MC04	1.68	FT	1.08		
5/30/2019	9:15	LLC	25.50	IN	0.98		
5/30/2019	10:00	FIN			1.42		
5/30/2019	10:20	GRS			0.87		
5/30/2019	10:30	NFPL			0.46		
5/30/2019	10:40	2ND			0.84		
5/30/2019	8:50	OWL	5.00	IN	1.30	230	11.7
5/30/2019	9:28	PLC	9.50	IN	0.74	165	11.2
5/30/2019	9:32	BOL			1.50	120	11.5
5/30/2019	10:06	CRR			1.01	199	7.1
5/30/2019	10:30	LCL			1.03	247	7.4
5/30/2019	10:41	DER	1.90	FT	0.79	142	4.4
5/30/2019	10:55	WFC			0.87	284	63.7
5/30/2019	11:20	UCL	2.50	FT	1.36	148	7.4
5/30/2019	11:29	RIC	6.75	IN	2.60	152	7.2
5/31/2019	10:45	BER	14.75	IN	0.93	371	10.1
5/31/2019	10:55	EFC	16.50	IN	2.24	120	4.7
5/31/2019	11:05	RCM	8.00	IN	2.25	127	5.4

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity	Total Nitrogen	Total Phosphorus
				units	NTU	ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
5/31/2019	11:25	CLT	9.00	IN	1.78	119	16.6
5/31/2019	11:35	UHL	14.25	IN	1.36	97.2	19.2
5/31/2019	11:50	CMP	15.00	IN	1.47	91.6	3.8
6/2/2019	8:55	MTN	6.50	IN	0.57	121	5.1
6/2/2019	7:35	SEL	1.00	IN	2.60	224	15.9
6/2/2019	7:45	MDM	1.18	FT	2.55	290	8.6
6/2/2019	7:55	TRL	25.50	IN	1.92	261	6.1
6/2/2019	8:00	BLI	4.00	IN	1.43	290	7.3
6/2/2019	8:15	SWP	9.75	IN	0.85	157	7.3
6/5/2019	9:20	RIC	5.50	IN	1.15	152	8.6
6/5/2019	9:25	UCL	2.30	FT	0.98	116	5.7
6/5/2019	9:50	WFC			1.36	107	5.7
6/5/2019	10:00	DER	1.70	FT	0.75	107	5.7
6/5/2019	10:15	LCL			1.05	162	6.8
6/5/2019	10:30	CRR			0.77	187	8.5
6/5/2019	10:45	OWL	28.00	IN	1.00	228	13.1
6/5/2019	11:00	BOL	18.00	IN	1.31	97.6	6.5
6/5/2019	11:05	PLC	24.00	IN	0.61	140	11.5
6/6/2019	8:30	MC04	1.44	FT	1.28		
6/6/2019	8:40	LLC	24.50	IN	1.23		
6/6/2019	9:15	FIN			1.30		
6/6/2019	9:35	GRS			0.75		
6/6/2019	9:45	NFPL			0.70		
6/6/2019	10:00	2ND			0.58		
6/7/2019	11:20	BER	10.50	IN	0.90	395	11.6
6/7/2019	11:35	EFC	14.00	IN	1.42	98.9	2.8
6/7/2019	11:50	RCM	5.00	IN	1.46	95.5	10.2
6/7/2019	12:20	CLT	8.00	IN	1.79	104	17.2
6/7/2019	12:40	UHL	12.75	IN	1.12	91.6	19.8
6/7/2019	13:00	CMP	13.25	IN	1.01	90.7	3.8
6/9/2019	16:30	MTN	5.75	IN	0.56	112	5.9
6/9/2019	16:05	SEL	1.00	IN	1.86	166	12.9
6/9/2019	15:15	MDM	0.70	FT	1.33	245	6.2
6/9/2019	15:25	TRL	20.25	IN	1.22	179	7.5
6/9/2019	15:35	BLI	0.00	IN	0.87	210	5.2
6/9/2019	15:45	SWP	8.50	IN	0.37	95.7	5.1
6/12/2019	8:45	RIC	5.00	IN	0.56	124	7.2
6/12/2019	8:55	UCL	1.70	FT	0.57	117	6.2

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity NTU	Total Nitrogen	Total Phosphorus
				units		ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
6/12/2019	9:15	WFC			0.40	81.8	3.6
6/12/2019	9:30	DER	1.30	FT	0.40	82.3	5.0
6/12/2019	9:35	LCL			0.48	152	6.3
6/12/2019	9:50	CRR			0.65	168	7.5
6/12/2019	10:35	BOL	17.00	IN	0.52	96.4	6.2
6/12/2019	10:40	PLC	21.00	IN	0.47	119	10.8
6/12/2019	10:15	OWL	24.50	IN	0.40	220	10.9
6/13/2019	9:12	MC04	1.12	FT	0.66		
6/13/2019	9:20	LLC	18.00	IN	0.62		
6/13/2019	10:13	FIN			0.48		
6/13/2019	10:33	GRS			0.66		
6/13/2019	10:43	NFPL			0.36		
6/13/2019	10:52	2ND			0.52		
6/14/2019	12:15	BER	8.00	IN	0.76	390	10.9
6/14/2019	12:25	EFC	10.25	IN	0.56	95.4	3.7
6/14/2019	12:45	RCM	6.50	IN	0.98	101	5.6
6/14/2019	13:05	CLT	6.75	IN	1.37	116	20
6/14/2019	13:20	UHL	11.25	IN	0.74	98.1	19.2
6/14/2019	13:35	CMP	11.00	IN	0.63	92.3	5.3
6/16/2019	14:05	MTN	4.75	IN	1.00	101	4.2
6/16/2019	12:40	SEL	0.50	IN	1.33	183	14.0
6/16/2019	12:50	MDM	0.68	FT	0.78	188	3.3
6/16/2019	13:05	TRL	18.00	IN	0.45	171	5.4
6/16/2019	13:15	BLI	0.00	IN	0.57	182	4.3
6/16/2019	13:25	SWP	7.50	IN	0.36	118	5.9
6/19/2019	12:02	MC04	0.9	FT	0.80		
6/19/2019	12:12	LLC	16	IN	0.81		
6/19/2019	12:47	FIN			0.52		
6/19/2019	1:05	GRS			0.57		
6/19/2019	1:13	NFPL			0.23		
6/19/2019	1:20	2ND			0.51		
6/20/2019	7:18	OWL	20.75	IN	1.06	249	15.1
6/20/2019	7:49	BOL	14.50	IN	0.93	119	10.4
6/20/2019	7:53	PLC	19.50	IN	0.55	110	11.3
6/20/2019	8:23	CRR			1.03	156	7.0
6/20/2019	8:41	LCL			1.62	281	17.6
6/20/2019	8:51	DER	1.43	FT	0.49	99.1	3.5
6/20/2019	9:01	WFC			0.57	82.6	3.8

Appendix B 2019 (continued)

Date	Time	Site Code	Gage	Gage	Turbidity	Total Nitrogen	Total Phosphorus
				units	NTU	ug/L-N MDL: 25.0	ug/L-P MDL: 1.5
6/20/2019	9:14	UCL	1.30	FT	0.71	138	6.2
6/20/2019	9:29	RIC	5.00	IN	0.52	127	10.0
6/21/2019	9:50	BER	9.50	IN	0.57	371	11.1
6/21/2019	10:05	EFC	8.00	IN	0.77	86.6	2.7
6/21/2019	10:15	RCM	6.50	IN	0.76	97.9	4.9
6/21/2019	10:30	CLT	6.25	IN	0.17	115	18.8
6/21/2019	10:45	UHL	10.25	IN	0.85	91.1	19.9
6/21/2019	11:00	CMP	11.00	IN	0.80	72.6	4.3
6/24/2019	16:45	MTN	4.00	IN	0.31	86.6	4.5
6/24/2019	14:40	SEL	0.00	IN	1.16	155	13.5
6/24/2019	14:50	MDM	0.46	FT	0.56	194	4.0
6/24/2019	15:05	TRL	11.00	IN	0.28	127	4.0
6/24/2019	15:15	BLI	0.00	IN	0.34	183	3.6
6/24/2019	15:30	SWP	7.00	IN	0.48	97	4.8
6/26/2019	9:32	MC04	0.78	FT	0.40		
6/26/2019	9:41	LLC	13.50	IN	1.33		
6/26/2019	10:16	FIN			0.47		
6/26/2019	10:32	GRS			0.44		
6/26/2019	10:40	NFPL			0.23		
6/26/2019	10:49	2ND			0.37		
6/26/2019	7:30	RIC	4.50	IN	0.35	95.7	6.2
6/26/2019	7:35	UCL	1.10	FT	0.58	125	7.0
6/26/2019	7:50	WFC			0.32	54.0	2.5
6/26/2019	8:05	DER	1.35	FT	0.36	77.3	4.0
6/26/2019	8:20	LCL			0.64	149	6.7
6/26/2019	8:35	CRR			1.12	177	8.3
6/26/2019	8:55	OWL	17.00	IN	0.45	203	11.9
6/26/2019	9:15	BOL	14.00	IN	0.71	97.4	6.3
6/26/2019	9:20	PLC	16.50	IN	0.35	87.5	9.4
6/30/2019	16:05	BER	5.00	IN	1.34	366	21.4
6/30/2019	16:15	EFC	4.75	IN	0.87	81.4	3.2
6/30/2019	16:30	RCM	6.00	IN	0.53	71.2	4.5
6/30/2019	16:50	CLT	5.75	IN	1.70	96.6	18.5
6/30/2019	17:10	UHL	10.00	IN	0.62	55.8	17.2
6/30/2019	17:25	CMP	10.25	IN	0.54	64.6	3.6