Puyallup River Tributaries Effectiveness Monitoring Quarterly Report: January – March 2024 (Year 5)

Abstract

Year 5 of the 10-Year Puyallup River Tributaries Effectiveness Monitoring project conducted by the Department of Ecology began in July, 2023. This report summarizes bacteria, nutrients, and conventional water quality parameter results from the third quarter (January through March of 2024) of Year 5. The first, fifth and tenth years of this project include a greater frequency and spatial resolution of data collection; these years are referred to as Implementation years. During the years between Implementation years, referred to as Status and Trends monitoring years, only one downstream site on each of the three tributaries (Boise Creek, Second Creek and Pussyfoot Creek) is routinely monitored, with one additional tributary site on Boise Creek. During the Implementation monitoring, there are nine sites on Boise Creek, eight sites on Second Creek, and ten sites on Pussyfoot Creek. This increase in spatial resolution allows project partners to focus efforts by identifying portions within each watershed where data may suggest pollution sources are entering the stream. More details concerning site locations, sample frequency, methods, etc. are described in the study's Quality Assurance Project Plan[1] (Brownlee 2019).

Report Summary

- The months of January through March typically saw the lowest levels of bacterial pollution of Year 5, which is expected this time of year with reduced manure applications as well as a landscape that is well "flushed" from precipitation in November and December.
- Ecology collected samples and measurements twice per month at all 27 established Implementation sites. Two additional sites on the Enumclaw Golf Course were sampled routinely as well.
- All sites on Boise Creek except Boise_ST2 met the water quality criteria for *E. coli*. South fork of Pussyfoot Creek had two sites meeting criteria. No sites met criteria on Second Creek.
- Boise Creek at the golf course (Boise_G1) and Boise_I5, just below the golf course, were the only sites that had no exceedance below the minimum dissolved oxygen water quality criteria during this period.

[1] https://apps.ecology.wa.gov/publications/SummaryPages/1910040.html

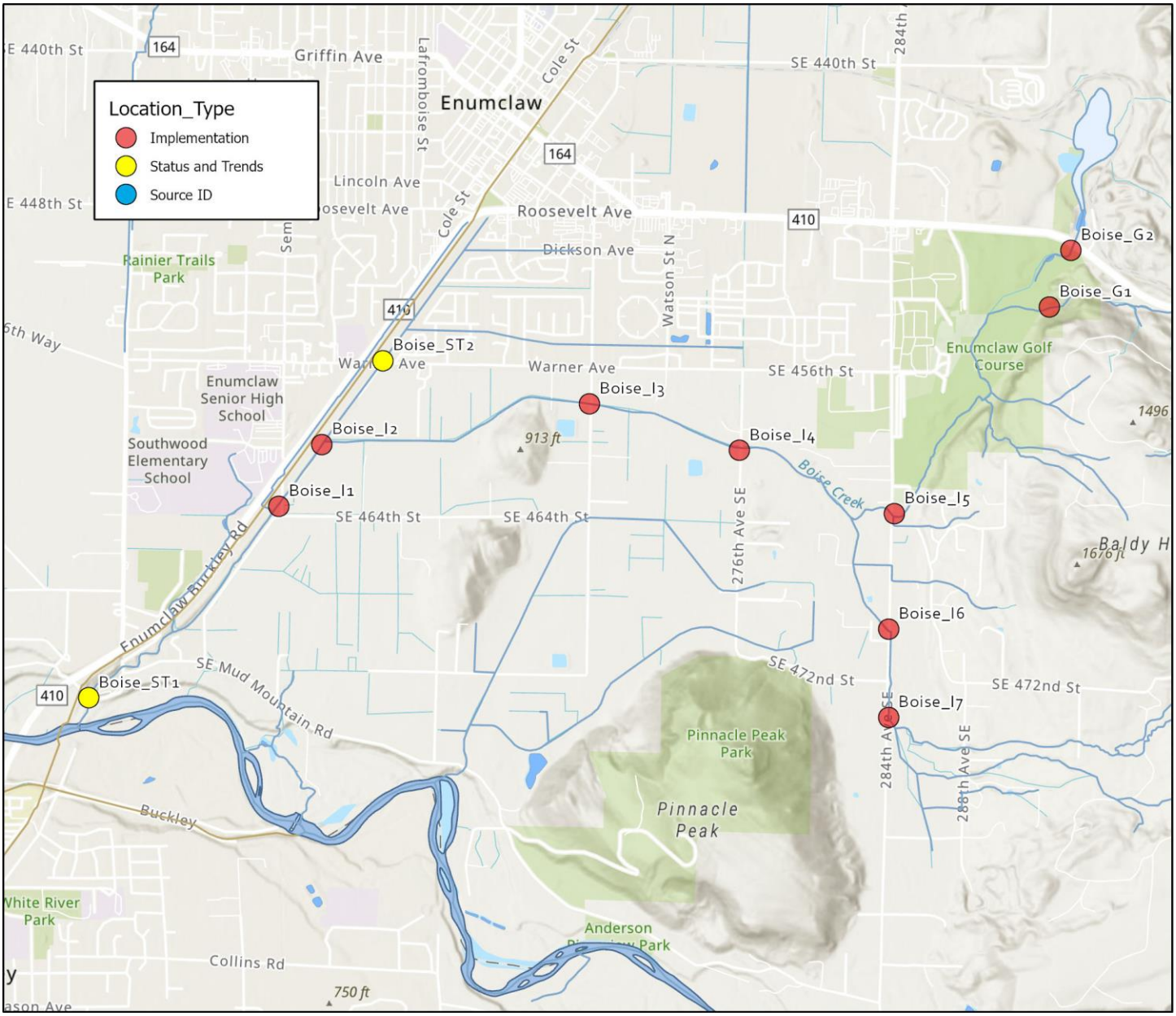

Figure 1. Boise Creek sampling sites during the third quarter of Year 5.

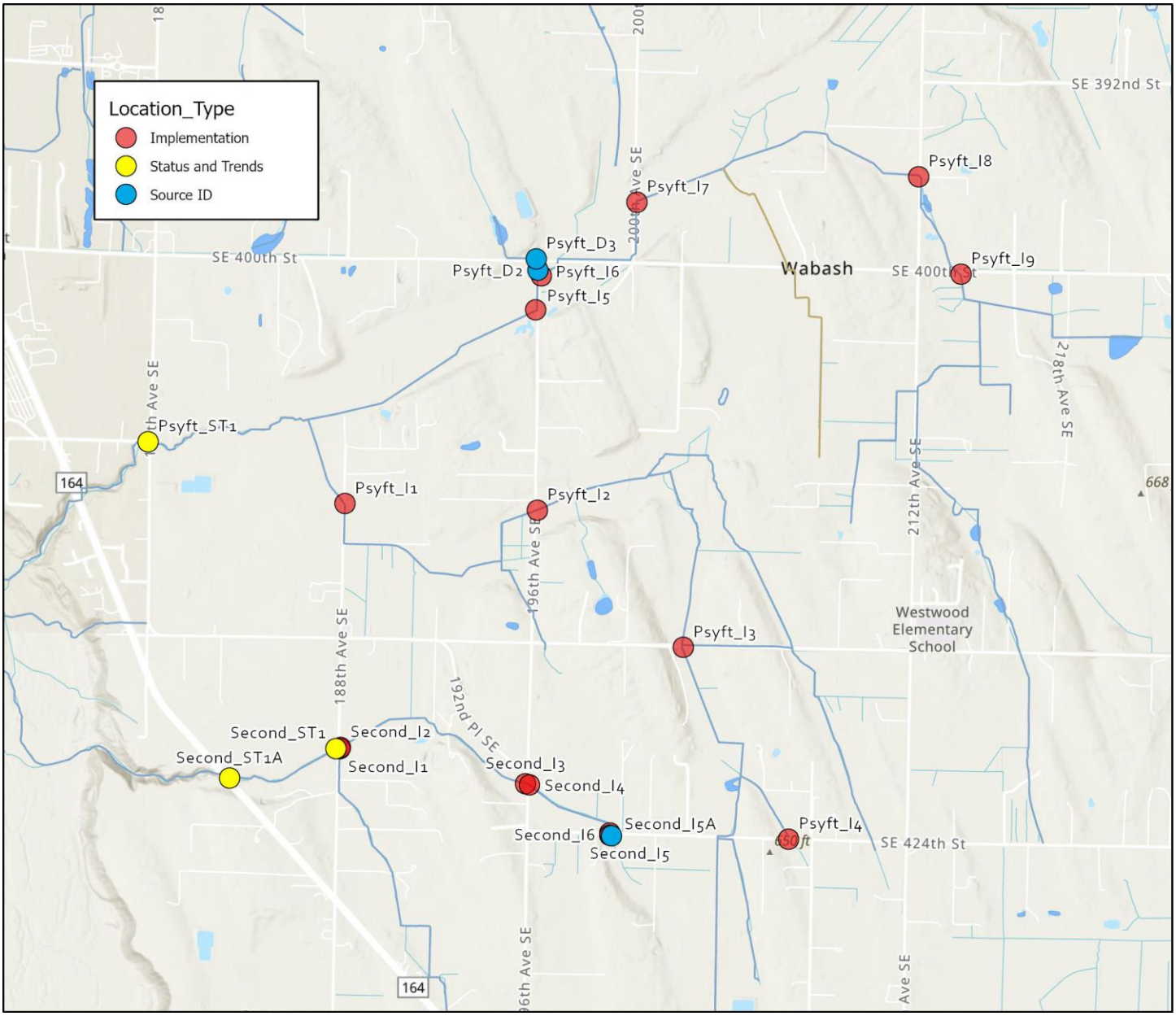

Figure 2. Boise Creek sampling sites during the third quarter of Year 5.

Precipitation and Flow

Based on preliminary data from the Boise Creek USGS stream gage, the month of January had higher-than-average flows, while the months of February and March had lower-than-average flows compared to a typical year, with March having nearly half the average daily flow of a typical year (Table 1 and Figure 2)

Table 1. Total precipitation (data from King County site 44u[2]) and average discharge (preliminary data from USGS site 12099600[3]) at Boise Creek at Mud Mountain Road Station.

Month	Total Precipitation (inches)	Average Discharge, CFS *(mean for all years)*
January	7.15	81.10 *(63.25)*
February	4.03	43.77 *(58.57)*
March	2.24	27.76 *(49.40)*

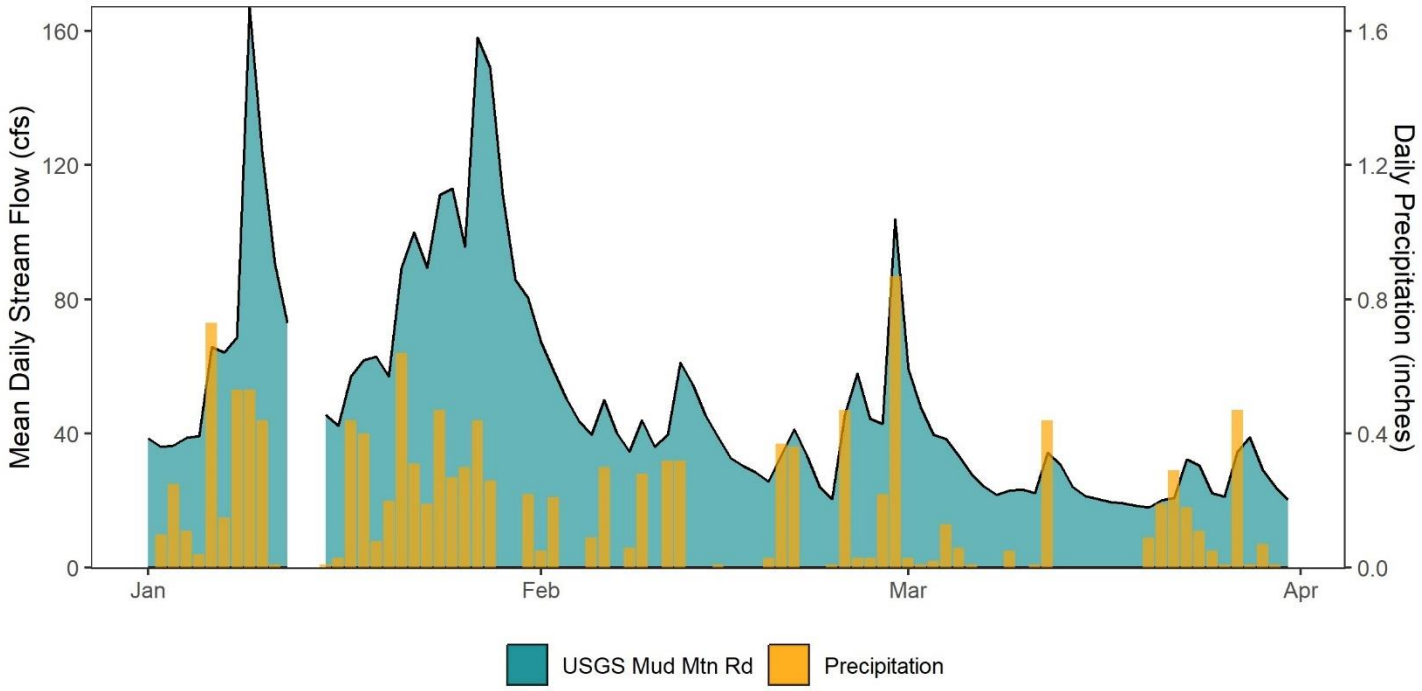

Figure 3. Mean daily stream flow (preliminary data from USGS site 12099600[4]) and daily precipitation (data from King County site 44u[5]) at Boise Creek at Mud Mountain Road station from January 1 – March 31, 2024.

[2] https://green2.kingcounty.gov/hydrology/DataDownload.aspx
[3] https://waterdata.usgs.gov/wa/nwis/uv/?site_no=12099600&PARAmeter_cd=00060,00065
[4] https://waterdata.usgs.gov/wa/nwis/uv/?site_no=12099600&PARAmeter_cd=00060,00065
[5] https://green2.kingcounty.gov/hydrology/DataDownload.aspx

Bacteria

Bacteria standards state 1) the geometric mean for *E. coli* must not exceed 100 cfu/100mL and 2) no more than 10 percent of all samples (or any single sample when less than ten sample points in an averaging period exist) should exceed 320 cfu/100mL. Figures 4-6 contain box plots of bacteria concentrations for each site during this period.

The Puyallup River Watershed Fecal Coliform TMDL (Mathieu and James, 2011) sets more protective targets, based on the rollback method outlined in Appendix G of that document, using the fecal coliform indicator for the downstream Status and Trends sites on Boise and Pussyfoot creeks. During Quarter 3 of Year 5 none of the sites fully met these targets, and the following narrative will focus on the state water quality standards using *E. coli* mentioned above.

During the third quarter of Year 5 numerous sites met the water quality criteria for *E. coli* (Figure 4). The months of January through March typically see the lowest levels of bacterial pollution, with reduced manure applications as well as a landscape that is well "flushed" from precipitation in November and December. On Boise Creek the only site that exceeded the water quality criteria for *E. coli* was Boise_ST2; all other sites met these criteria. On Pussyfoot Creek the sites Psyft_I2 and Psyft_I4, which are on the south fork of this drainage, met these criteria by a large margin (geomeans/90th percentiles of 32/106 and 14/85 CFU/100mL, respectively), while Psyft_I7 on the north fork narrowly met criteria with a geomean of 53 CFU/100mL and 90th percentile of 320 CFU/100mL, which is exactly the maximum 90th percentile value allowable under the criteria. In Second Creek there were no sites that met the criteria.

the only sites to meet both components of the water quality criteria for *E. coli* were the two sites located on the Enumclaw Golf Course, Boise_G1 and Boise_G2, and two stations on the south fork of Pussyfoot Creek, Psyft_I2 and Psyft_I3. The two Boise Creek stations are located upstream of almost all developed areas in the Enumclaw plateau (Figure 1). The locations Psyft_I4 and Psyft_I1 are upstream and downstream, respectively, of Psyft_I2 and Psyft_I3. Psyft_I4 did not meet either component of the water quality criteria. This site has lower flows than Psyft_I3, and the decrease in levels at Psyft_I3 may reflect dilution between stations, a sign that flows entering between these sites is likely meeting criteria.

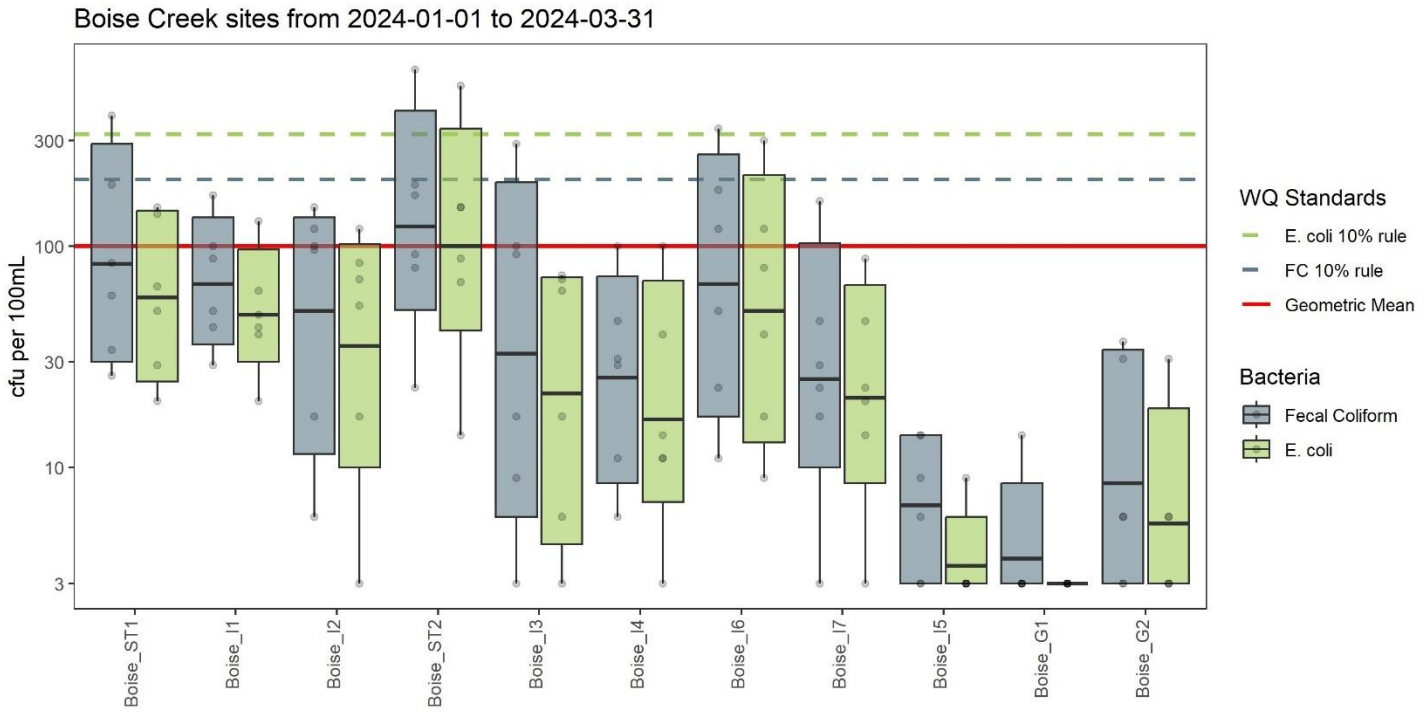

Figure 4. Bacteria levels in Boise Creek from January through March of 2024 with geometric mean (black solid line in boxplot) and 90th percentile (top of colored boxes). Water quality standards displayed as horizontal lines. Sites are ordered from downstream to upstream, left to right.

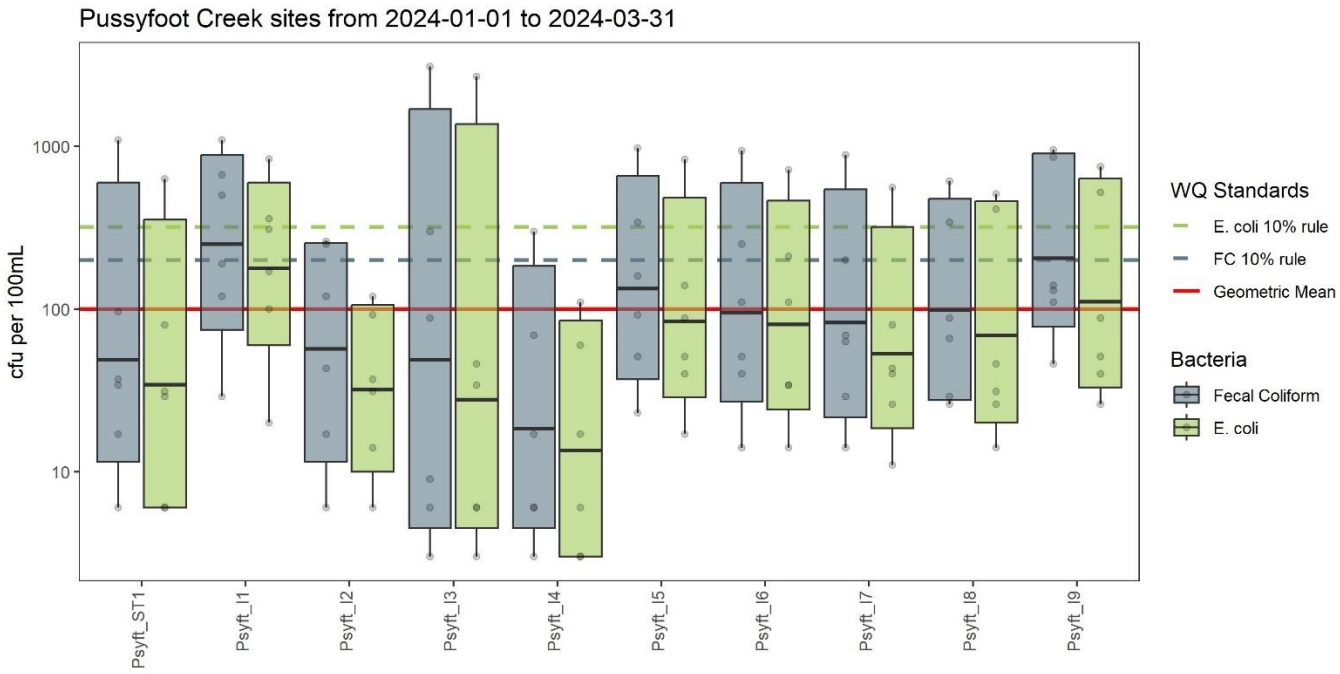

Figure 5. Bacteria levels in Pussyfoot Creek from January through March of 2024 with geometric mean (black solid line in boxplot) and 90th percentile (top of colored boxes). Water quality standards displayed as horizontal lines. Sites are ordered from downstream to upstream, left to right.

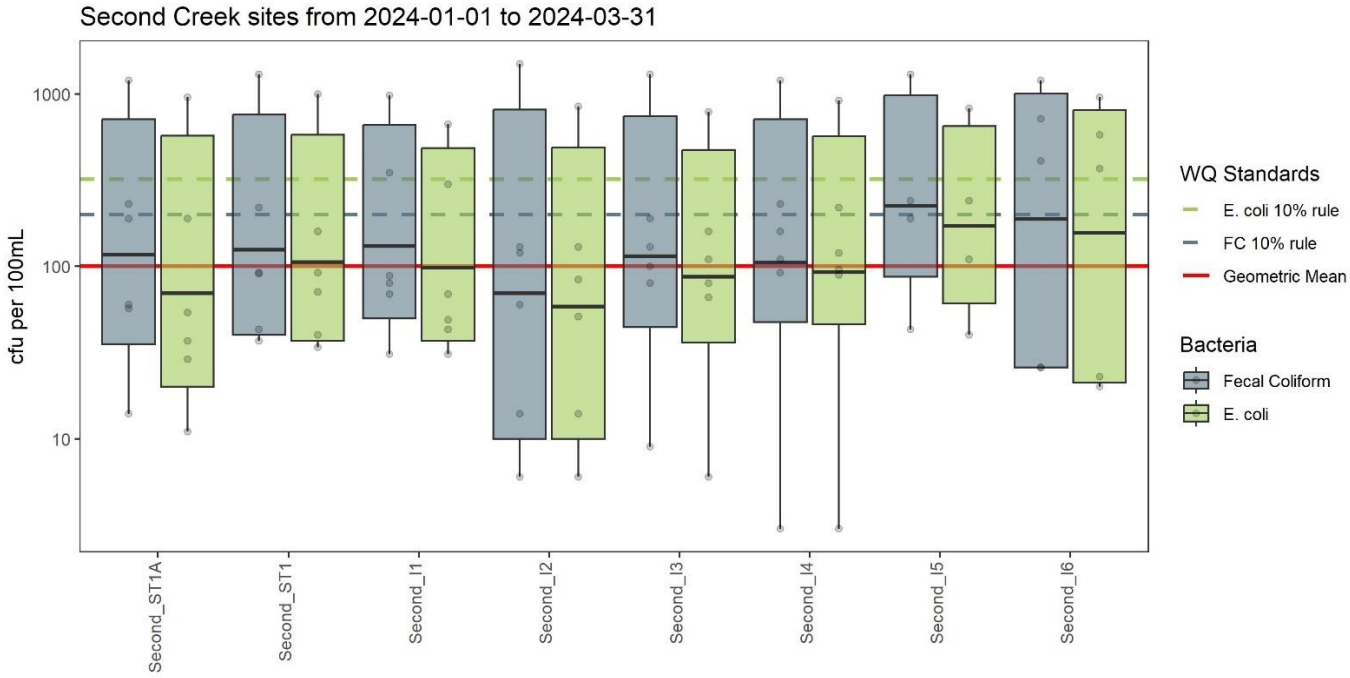

Figure 6. Bacteria levels in Second Creek from January through March of 2024 with geometric mean (black solid line in boxplot) and 90th percentile (top of colored boxes). Water quality standards displayed as horizontal lines. Sites are ordered from downstream to upstream, left to right.

Nutrients

Second Creek continues to show the highest concentrations of all nutrient parameters measured, followed by Pussyfoot Creek, and with Boise Creek typically having the lowest concentrations (Figures 8-10). Orthophosphate concentrations appear to align with the previous four years of monitoring for the wet season (October-April) in this study, and show no increasing or decreasing trends (Figure 7).

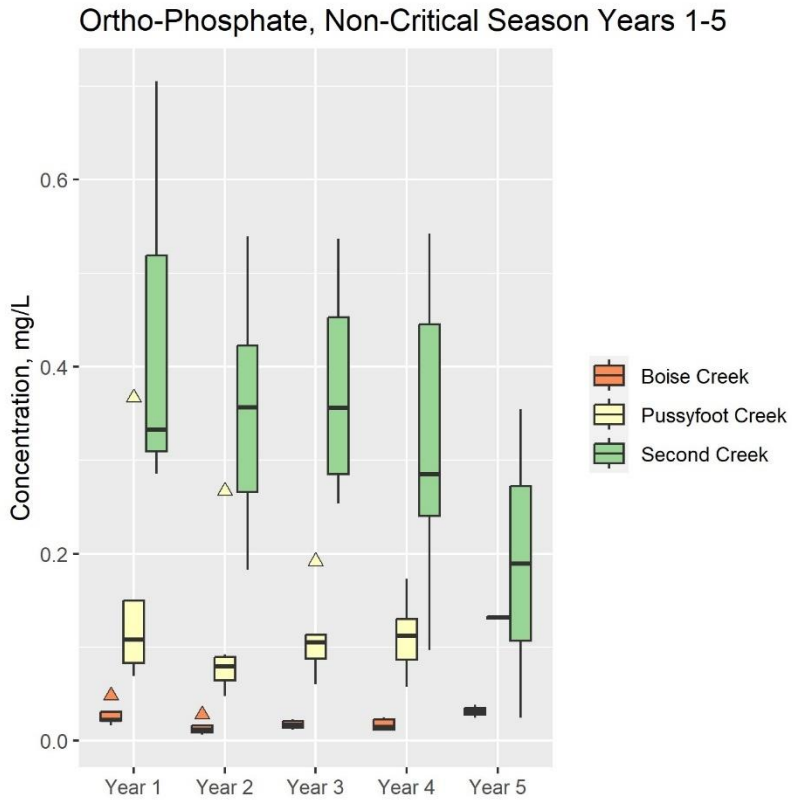

Figure 7. Box plots showing Ortho-Phosphate concentrations during the first four and a half years of this study.

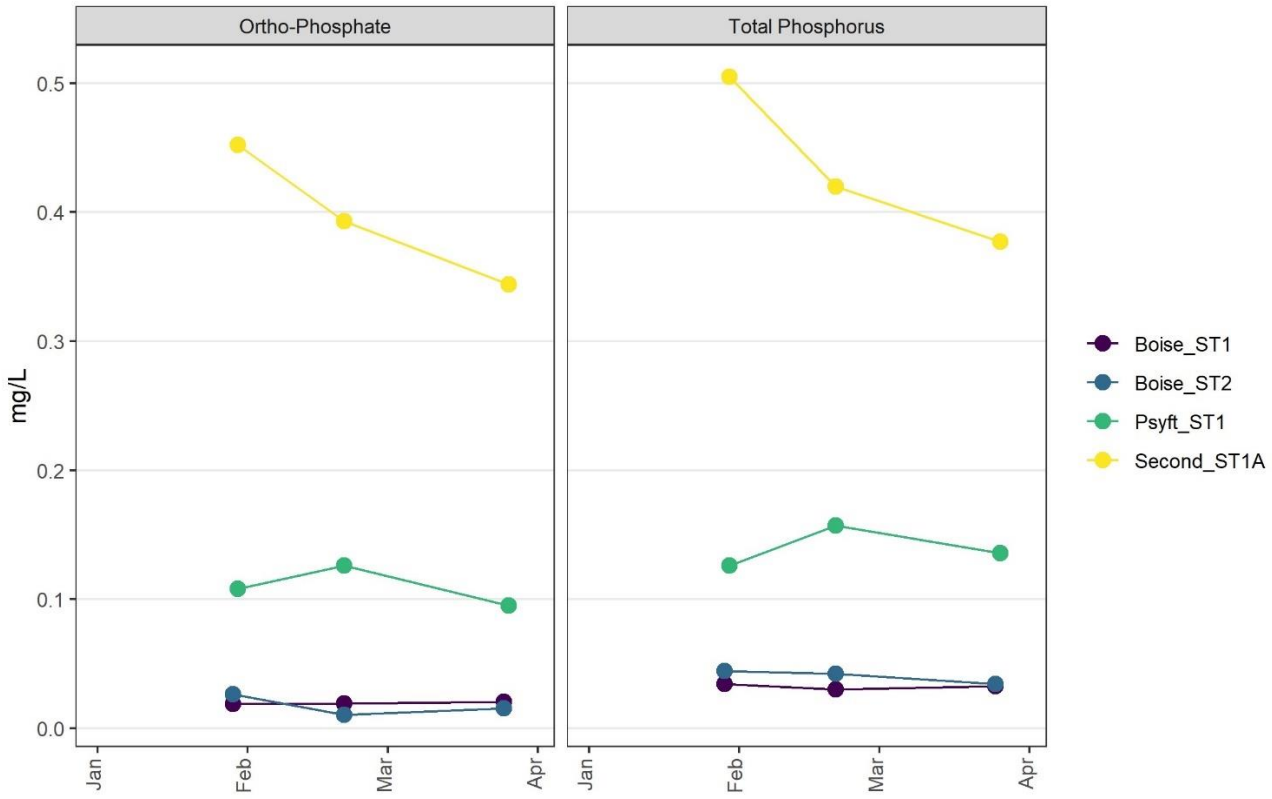

Figure 8. Concentration of monitored phosphorous species over time during the third quarter of Year 5.

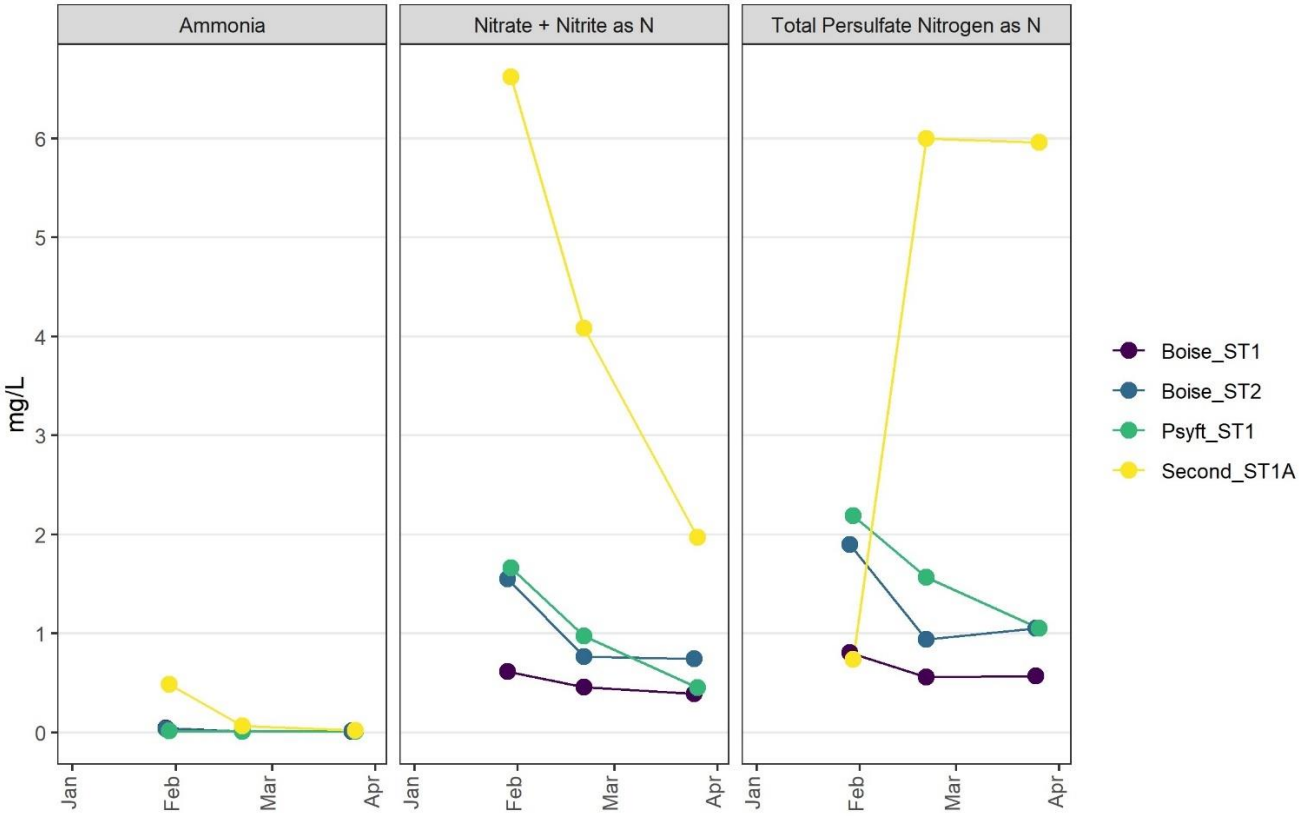

Figure 9. Concentration of monitored nitrogen species over time during the third quarter of Year 5.

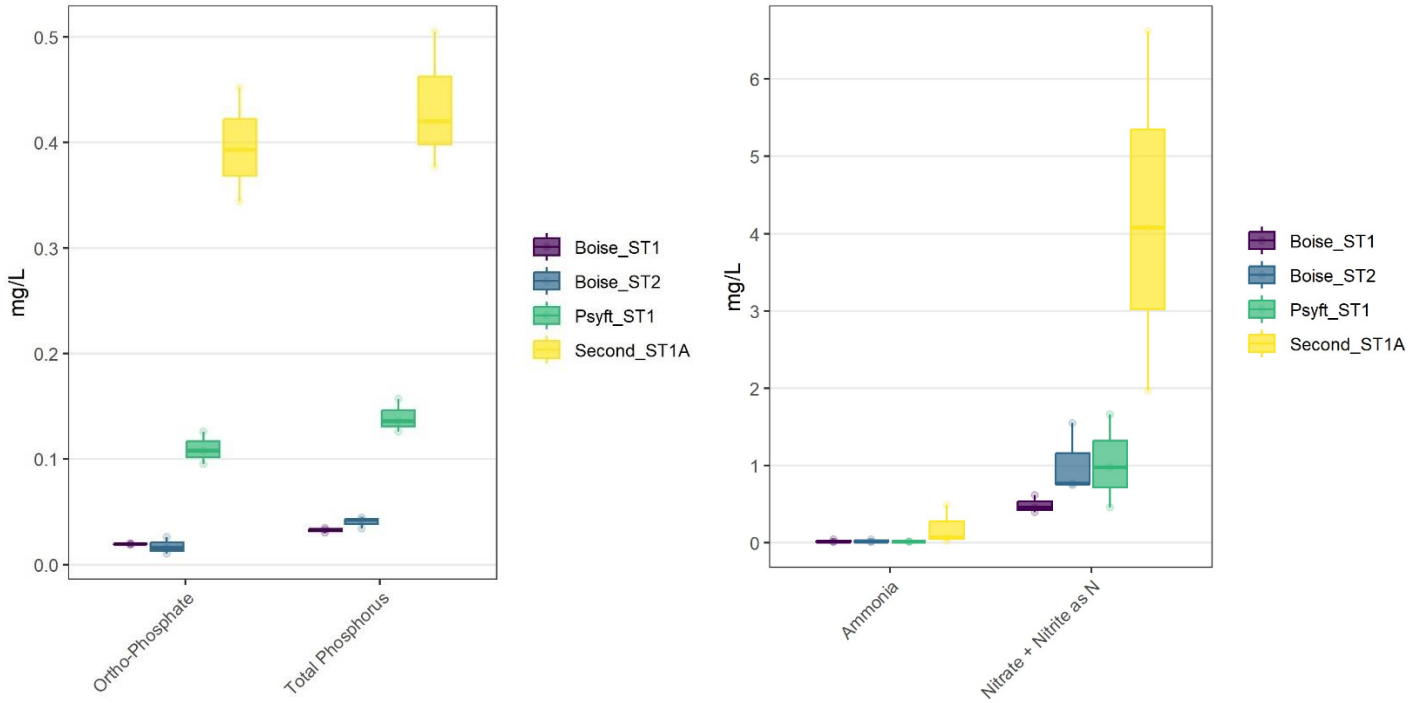

Figure 10. Box plots of phosphorous and nitrogen concentration in January through March 2024 with the median value represented as a solid line in the boxplot.

Water Quality Measurements

Turbidity

Except for Boise_G2, which was subject to a known sediment discharge from an industrial operation in February of 2024, all sites maintained relatively low levels of turbidity throughout this period. The north fork of Pussyfoot Creek and Second Creek saw higher levels of turbidity than Boise Creek, while the south fork of Pussyfoot Creek had notably lower values for turbidity than the north fork. The moderately higher levels of turbidity in the north fork of Pussyfoot Creek and in Second Creek align with areas where the highest levels of bacteria were observed during this period.

Dissolved Oxygen

The only sites in Boise Creek to meet the dissolved oxygen criteria during all visits was Boise_G1, at the golf course, and Boise_I5, just below the golf course (Figure 11). There were no sites in Pussyfoot or Second Creeks that met the dissolved oxygen criteria during all visits (Figures 12- and 13).

Temperature, Specific Conductivity, and pH

Continuous temperature data, which was not collected during this period, is needed to properly compare with the temperature criteria. This section will compare discrete measurement data to the 7-day average daily maximum (7DADMax), though this is not a suitable method for assessing a waterbody against the water quality criteria for temperature. There were no sites with observed temperature measurements that exceeded the applicable 7DADMax value (Figures 11-13). Lower temperatures are to be expected during this winter period.

All pH measurements met water quality criteria (6.5 to 8.5 pH units).

Conductivity measurements in Second Creek showed a consistent trend of increased conductivity the further upstream the measurement was taken, with Second_I6 showing the highest observed measurements (Figure 13). In Boise Creek, the tributary at Boise_ST2 and Chapel Springs at Boise_G2 showed consistently higher levels of conductivity than what was observed in the mainstem of Boise Creek (Figure 11).

Figure 11. Boise in-situ measurement mean and range by parameter and site during the third quarter of Year 5 with water quality criteria marked in red, where applicable. Note the supplemental spawning criteria for Boise Creek from Sept 1-July 1 (13°C).

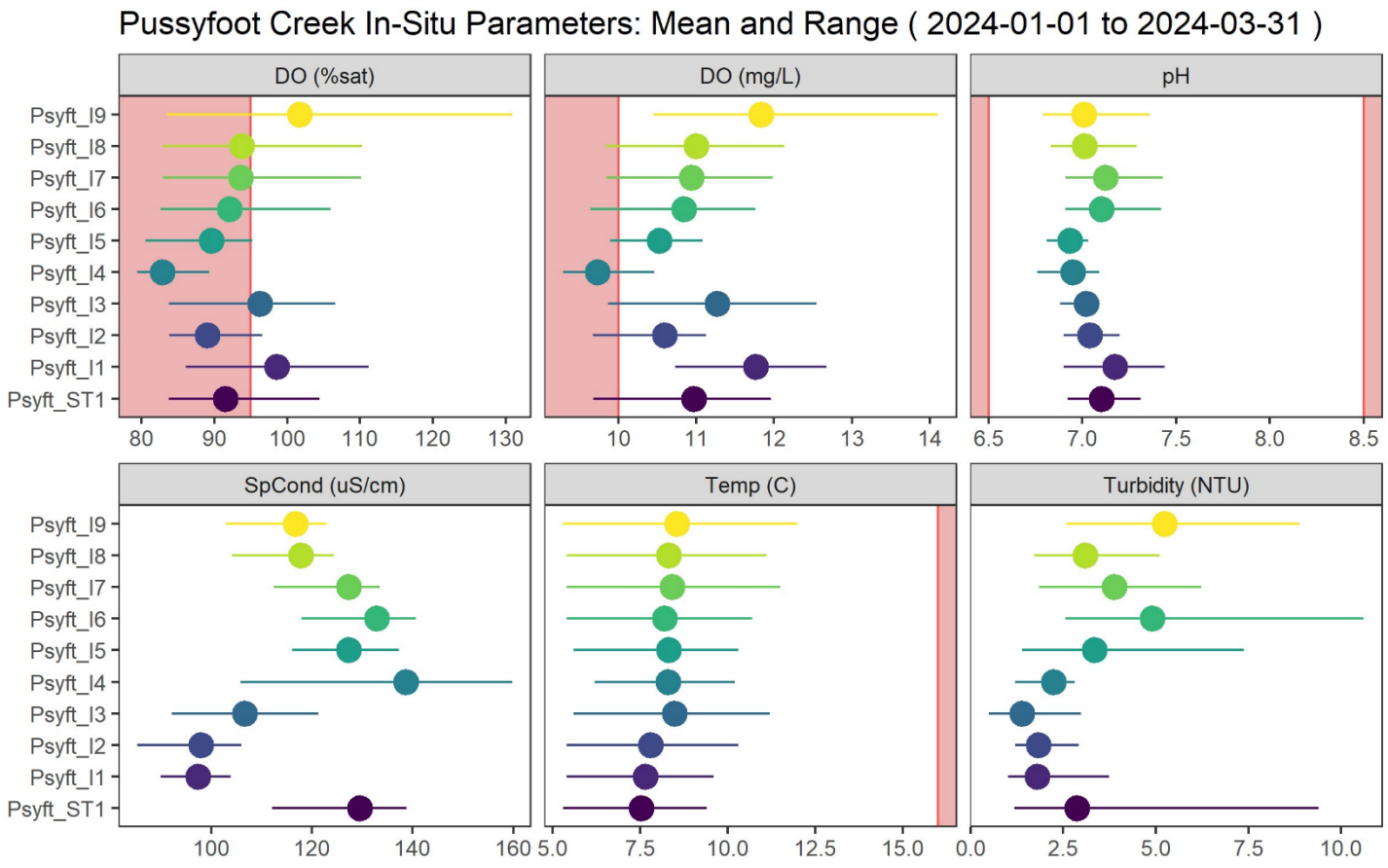

Figure 12. Pussyfoot Creek in-situ measurement mean and range by parameter and site during the third quarter of Year 5 with water quality criteria marked in red, where applicable.

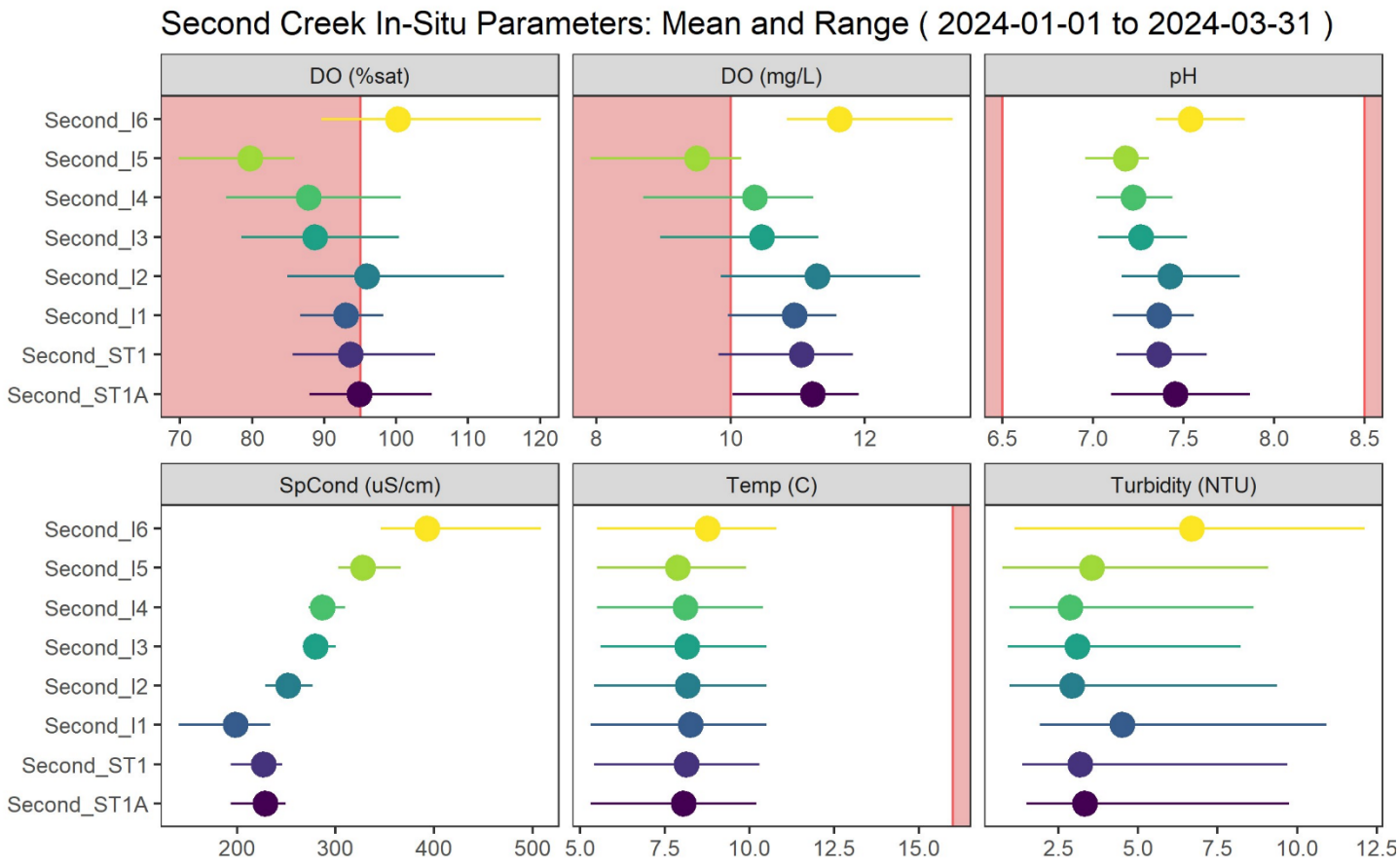

Figure 13. Second Creek in-situ measurement mean and range by parameter and site during the third quarter of Year 5 with water quality criteria marked in red, where applicable.

References

Brownlee, A. 2019. Quality Assurance Project Plan: Puyallup River Tributaries Effectiveness Monitoring. Ecology publication 19-10-040.

Gray, D. and Mathieu, N. 2022. Lower White River pH Total Maximum Daily Load. Washington State Department of Ecology, Olympia, WA. Publication No. 22-10-011. https://apps.ecology.wa.gov/publications/SummaryPages/2210011.html

Mathieu, N. and James, C. 2011. Puyallup River Watershed: Fecal Coliform Total Maximum Daily Load – Water Quality Improvement Report and Implementation Plan. Washington State Department of Ecology, Olympia, WA. Publication No. 11-10-040. https://test-fortress.wa.gov/ecy/publications/SummaryPages/1110040.html

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Water Quality Program, 2018. Water Quality Program Policy 1-11: Washington's Water Quality Assessment Listing Methodology to Meet Clean Water Act Requirements. Ecology publication 18-10-035. https://fortress.wa.gov/ecy/publications/SummaryPages/1810035.html

Water Quality Standards for Surface Waters of the State of Washington Section 173-201A. https://apps.leg.wa.gov/WAC/default.aspx?cite=173-201A

King County (2023). King County Hydrologic Information Center, 69G - Beaver CR near Boise Confluence Stream Gauge https://green2.kingcounty.gov/hydrology/GaugeMetaData.aspx?G_ID=2166

Appendix

Table A1. Preliminary results for all sites. Blank cells represent that a sample or measurement was not collected.

Study_Specific_Location_ID	Field_Collection_Start_Date	Field_Collection_Start_Time	E. coli	Fecal Coliform	Barometric pressure	Conductivity, Specific (at 25 deg C)	Dissolved Oxygen	Dissolved Oxygen Percent Saturation	pH	Temperature, water	Turbidity	Ammonia	Nitrate + Nitrite as N	Ortho-Phosphate	Total Persulfate Nitrogen as N	Total Phosphorus
456th_212th_SE	1/9/2024	11:45:00	1200	1500												
Boise_G1	1/8/2024	13:55:00	3	3	29.07	55.5	12.24	96.9	7.5	5.4	1.73					
Boise_G1	1/29/2024	15:25:00	3	3	29.052	41.3	11.57	98.1	7.18	8.2	3.14					
Boise_G1	2/12/2024	13:35:00	3	3	29.268	51.1	11.96	98.1	7.42	6.8	2.58					
Boise_G1	2/21/2024	12:31:00	3	14	29.087	56	11.69	96.4	7.38	7.1	1.26					
Boise_G1	3/11/2024	13:54:00	3	3	28.828	53.9	11.76	95.8	7.62	6.6	0.8					
Boise_G1	3/25/2024	13:58:00	3	3	28.996	55.1	11.39	96.2	7.63	8	0.85					
Boise_G2	1/8/2024	13:45:00	6	31	29.076	169.5	9.34	74.9	7.15	5.9	4.15					
Boise_G2	1/29/2024	15:20:00	6	6	29.067	160.5	8.56	72.8	7.1	8.3	2.18					
Boise_G2	2/12/2024	13:25:00	31	37	29.274	178.7	9.74	80	7.21	6.8	19.46					
Boise_G2	2/21/2024	12:25:00	3	6	29.091	178.6	10.04	81.6	7.13	6.4	70.58					
Boise_G2	3/11/2024	13:44:00	3	3	28.84	191.6	9.46	78.5	7.28	7.2	1.04					
Boise_G2	3/25/2024	13:52:00	3	3	29.002	194.2	8.58	76.9	7.29	10.4	1.72					
Boise_I1	1/8/2024	12:08:00	49	88	29.209	75.1	11.73	92.6	6.96	5.3	3					
Boise_I1	1/29/2024	12:52:00	43	43	29.147	53.4	11.06	94.2	6.83	8.3	4.57					
Boise_I1	2/12/2024	12:00:00	130	170	29.35	74.1	11.51	95	7.02	7.1	3.72					
Boise_I1	2/21/2024	11:18:00	63	100	29.154	72	11.44	94.2	7.08	7	1.62					
Boise_I1	3/11/2024	12:08:00	20	29	28.958	67	11.81	95.7	7.35	6.3	1.16					
Boise_I1	3/25/2024	12:11:00	40	51	29.097	74.7	11.28	95.8	7.32	8.3	1.52					
Boise_I2	1/8/2024	12:22:00	71	100	29.194	84.2	11.5	91.1	7.04	5.4	3.4					
Boise_I2	1/29/2024	13:07:00	17	17	29.141	61.8	11.11	95	6.95	8.5	4.18					
Boise_I2	2/12/2024	12:16:00	120	150	29.345	81.3	11.56	95.8	7.08	7.2	3.52					
Boise_I2	2/21/2024	11:26:00	54	120	29.157	79.4	11.44	94.4	7.12	7.1	1.77					
Boise_I2	3/11/2024	12:28:00	3	6	28.94	73.6	11.9	96.9	7.44	6.5	1.15					

Boise_I2	3/25/2024	12:23:00	84	96	29.094	87.6	11.36	97.6	7.37	8.7	1.42					
Boise_I3	1/8/2024	12:55:00	63	92	29.167	69	11.79	93.2	7.21	5.4	2.71					
Boise_I3	1/29/2024	14:16:00	17	17	29.111	47.4	11.24	95.9	7.19	8.5	4.15					
Boise_I3	2/12/2024	12:36:00	71	100	29.336	65.5	11.53	95	7.22	7	3.76					
Boise_I3	2/21/2024	11:49:00	74	290	29.142	66.3	11.42	94.1	7.3	7	2.97					
Boise_I3	3/11/2024	12:53:00	3	3	28.922	60.5	11.78	96	7.44	6.6	1.13					
Boise_I3	3/25/2024	13:16:00	6	9	29.076	66.1	11.31	96.6	7.43	8.5	1.34					
Boise_I4	1/8/2024	13:02:00	11	31	29.147	65.1	11.68	93.9	7.15	5.4	2.93					
Boise_I4	1/29/2024	14:27:00	3	6	29.097	46.2	11.33	96.7	7.09	8.4	4.49					
Boise_I4	2/12/2024	12:43:00	100	100	29.324	61.1	11.62	95.7	7.15	7	3.71					
Boise_I4	2/21/2024	11:56:00	14	29	29.13	64.6	11.5	94.8	7.29	7	1.71					
Boise_I4	3/11/2024	13:03:00	40	46	28.902	60.1	11.71	96.4	7.49	6.6	1.09					
Boise_I4	3/25/2024	13:24:00	11	11	29.058	64.9	11.35	96.9	7.52	8.5	1.08					
Boise_I5	1/8/2024	13:14:00	3	9	29.123	59.6	12.01	95.1	7.31	5.4	2.12					
Boise_I5	1/29/2024	14:38:00	3	3	29.07	42.7	11.47	97.5	7.16	8.3	3.61					
Boise_I5	2/12/2024	12:54:00	9	14	29.309	55.7	11.77	96.7	7.33	6.9	3.82					
Boise_I5	2/21/2024	12:01:00	3	14	29.11	60.2	11.55	95.2	7.11	7	1.57					
Boise_I5	3/11/2024	13:13:00	3	6	28.884	57	11.8	96.3	7.51	6.6	0.95					
Boise_I5	3/25/2024	13:29:00	3	3	29.04	60.9	11.36	96.7	7.54	8.3	0.95					
Boise_I6	1/8/2024	13:22:00	80	180	29.111	84.8	10.7	84.5	6.83	5.3	4.7					
Boise_I6	1/29/2024	14:52:00	40	51	29.067	74	9.82	86	6.74	9.5	2.91					
Boise_I6	2/12/2024	13:00:00	300	340	29.297	85.2	10.63	88	6.95	7.2	4.74					
Boise_I6	2/21/2024	12:05:00	120	120	29.106	91.9	10.46	86	6.9	6.9	9.81					
Boise_I6	3/11/2024	13:21:00	9	11	28.86	85.3	10.79	88.2	7.11	6.7	2.8					
Boise_I6	3/25/2024	13:35:00	17	23	29.026	92.6	10.23	88.5	7.09	9	3.14					
Boise_I7	1/8/2024	13:26:00	88	160	29.108	78.1	10.97	86.6	6.69	5.3	4.79					
Boise_I7	1/29/2024	14:58:00	23	23	29.055	64.7	10.14	87.8	6.61	9	3.36					
Boise_I7	2/12/2024	13:06:00	46	46	29.288	76.8	10.65	88.2	6.81	7.2	4.6					
Boise_I7	2/21/2024	12:10:00	20	29	29.106	85	10.57	87	6.84	7	4.21					
Boise_I7	3/11/2024	13:28:00	3	3	28.845	79.6	10.84	88.8	7.05	6.8	2.64					
Boise_I7	3/25/2024	13:39:00	14	17	29.017	83.8	10.2	88.1	6.99	8.9	3.47					
Boise_ST1	1/29/2024	12:22:00	20	26	29.244	55.5	11.42	97.1	6.9	8.3	4.49	0.042	0.616	0.0189	0.804	0.0345
Boise_ST1	2/21/2024	11:08:00	150	390	29.248	74.2	11.74	96.6	7.29	7	1.77	0.01	0.457	0.0194	0.557	0.0303
Boise_ST1	3/25/2024	11:52:00	51	60	29.185	77.6	11.48	97.4	7.68	8.2	1.84	0.01	0.394	0.0204	0.568	0.0329

Boise_ST1	1/8/2024	11:52:00	66	84	29.306	77.5	12.27	96.8	7.23	5.3	3.34					
Boise_ST1	2/12/2024	11:36:00	140	190	29.445	77.2	12.01	99.2	7.11	7.1	3.76					
Boise_ST1	3/11/2024	11:55:00	29	34	29.07	68.6	11.93	96.7	7.59	6.3	1.16					
Boise_ST2	1/29/2024	13:23:00	88	92	29.144	155.4	10.78	96.5	6.97	10.4	2.49	0.041	1.55	0.0263	1.9	0.0445
Boise_ST2	2/21/2024	11:42:00	69	80	29.15	132.7	11.57	97.2	7.21	7.8	4.89	0.01	0.767	0.0105	0.939	0.0424
Boise_ST2	3/25/2024	12:40:00	530	630	29.091	172	11.8	107.4	7.45	11.1	4.7	0.014	0.745	0.0157	1.05	0.0344
Boise_ST2	1/8/2024	12:43:00	150	170	29.188	113.3	10.72	86.1	6.96	6	6.04					
Boise_ST2	2/12/2024	12:27:00	150	190	29.345	134.5	11.94	101.2	7.12	8.1	3.99					
Boise_ST2	3/11/2024	12:43:00	14	23	29.934	189	13.44	114.8	7.91	8.5	1.95					
Psyft_D2	1/30/2024	13:50:00	9	49	29.215	119.4	8.25	72.4	6.58	9.6	7.02					
Psyft_D3	2/13/2024	14:30:00	88	92	29.451	158.4	8.21	71.3	6.46	9.1	9.24					
Psyft_I1	1/9/2024	12:39:00	360	670	29.073	90	10.9	86.1	6.9	5.4	3.74					
Psyft_I1	1/30/2024	12:04:00	100	120	29.306	96.2	10.73	93	7.05	9.1	1.02					
Psyft_I1	2/13/2024	12:05:00	840	1100	29.463	98	12.14	100.8	7.22	7.3	1.42					
Psyft_I1	2/21/2024	13:42:00	170	190	29.39	97.5	11.71	97.8	7.18	7.5	1.69					
Psyft_I1	3/12/2024	12:15:00	310	500	29.345	98.5	12.44	102.4	7.25	7	1.12					
Psyft_I1	3/26/2024	11:47:00	20	29	29.436	103.9	12.67	111.2	7.44	9.6	1.85					
Psyft_I2	1/9/2024	14:04:00	120	260	29.049	85.3	10.6	83.8	6.92	5.4	2.78					
Psyft_I2	1/30/2024	13:39:00	14	17	29.203	98.9	9.67	83.9	6.9	9.1	1.21					
Psyft_I2	2/13/2024	14:12:00	6	6	29.433	99.2	10.79	89.2	7.03	7.1	1.47					
Psyft_I2	2/21/2024	14:40:00	92	120	29.382	97.5	10.57	88	7.02	7.4	2.92					
Psyft_I2	3/12/2024	13:50:00	37	250	29.374	100.7	11.13	92.9	7.2	7.5	1.33					
Psyft_I2	3/26/2024	13:59:00	31	43	29.407	106	10.81	96.6	7.17	10.3	1.29					
Psyft_I3	1/9/2024	13:54:00	34	88	29.008	92.2	10.53	83.7	6.99	5.6	2.83					
Psyft_I3	1/30/2024	13:32:00	3	3	29.167	101	9.87	86.7	6.88	9.7	0.49					
Psyft_I3	2/13/2024	14:00:00	6	9	29.383	109.1	11.78	99.8	7.05	8.2	2.98					
Psyft_I3	2/21/2024	14:32:00	6	6	29.335	106.9	11.18	94.2	7.04	7.9	1.02					
Psyft_I3	3/12/2024	13:41:00	2700	3100	29.303	109.3	12.54	106.6	7.07	8.3	0.55					
Psyft_I3	3/26/2024	13:51:00	46	300	29.356	121.3	11.7	106.6	7.09	11.2	0.52					
Psyft_I4	1/9/2024	13:42:00	110	300	28.984	124.9	9.82	79.4	6.76	6.2	2.81					
Psyft_I4	1/30/2024	13:20:00	3	3	29.135	143.9	9.32	81	6.87	9.2	1.21					
Psyft_I4	2/13/2024	13:47:00	17	17	29.362	105.9	10.46	89.3	6.96	8.4	2.41					
Psyft_I4	2/21/2024	14:22:00	60	69	29.295	142.9	9.45	79.8	7.06	8	2.62					
Psyft_I4	3/12/2024	13:25:00	6	6	29.265	154.5	10.08	85.1	7.09	7.8	2.75					

Psyft_I4	3/26/2024	13:09:00	3	6	29.339	159.8	9.29	82.7	6.95	10.2	1.63					
Psyft_I5	1/9/2024	14:11:00	830	980	29.088	116.1	10.12	80.5	6.86	5.6	7.38					
Psyft_I5	1/30/2024	13:43:00	17	23	29.226	129	9.9	86.7	6.81	9.6	1.45					
Psyft_I5	2/13/2024	14:16:00	88	92	29.457	124.6	11.08	94.2	6.96	8.3	1.75					
Psyft_I5	2/21/2024	14:42:00	140	160	29.409	126	10.44	88.5	6.96	8.2	6.41					
Psyft_I5	3/12/2024	13:57:00	51	340	29.401	137.3	10.94	92.3	6.99	7.9	1.67					
Psyft_I5	3/26/2024	14:05:00	40	51	29.424	130.7	10.67	95.2	7.03	10.3	1.39					
Psyft_I6	1/9/2024	14:19:00	720	940	29.097	117.9	10.45	82.6	6.91	5.4	10.6					
Psyft_I6	1/30/2024	13:47:00	14	14	29.226	131	9.64	84.3	6.93	9.4	2.71					
Psyft_I6	2/13/2024	14:22:00	34	40	29.454	131.7	11	92.6	7.02	7.9	4.15					
Psyft_I6	2/21/2024	14:45:00	210	250	29.413	137.7	10.75	90.4	7.12	7.8	4.87					
Psyft_I6	3/12/2024	14:02:00	110	110	29.398	140.7	11.47	96.8	7.22	8	4.5					
Psyft_I6	3/26/2024	14:10:00	34	51	29.43	138.6	11.76	106	7.42	10.7	2.56					
Psyft_I7	1/9/2024	14:24:00	560	890	29.097	112.5	10.4	82.9	6.93	5.4	6.23					
Psyft_I7	1/30/2024	14:05:00	11	14	29.206	128.2	9.85	86.2	6.91	9.5	1.85					
Psyft_I7	2/13/2024	14:39:00	40	63	29.454	127.7	11.05	93.6	7.12	8.1	4.9					
Psyft_I7	2/21/2024	14:48:00	80	200	29.406	129.2	10.81	91.1	7.13	7.9	4.21					
Psyft_I7	3/12/2024	14:07:00	26	29	29.392	132.7	11.54	97.8	7.22	8.1	3.32					
Psyft_I7	3/26/2024	14:16:00	43	69	29.421	133.5	11.98	110.1	7.43	11.5	2.81					
Psyft_I8	1/9/2024	14:30:00	510	610	29.076	104.1	10.48	82.9	6.89	5.4	5.11					
Psyft_I8	1/30/2024	14:12:00	26	29	29.176	121.5	9.84	86.2	6.83	9.5	1.73					
Psyft_I8	2/13/2024	14:46:00	46	66	29.43	118.1	11.25	95.6	6.92	8.2	2.25					
Psyft_I8	2/21/2024	14:55:00	410	340	29.382	117.4	10.73	90.2	6.99	7.8	4.97					
Psyft_I8	3/12/2024	14:24:00	14	26	29.371	121.1	11.55	97.2	7.16	7.9	2.17					
Psyft_I8	3/26/2024	14:24:00	31	88	29.404	124.4	12.13	110.3	7.29	11.1	2.3					
Psyft_I9	1/9/2024	14:35:00	520	860	29.064	103	10.57	83.4	6.91	5.3	5.84					
Psyft_I9	1/30/2024	14:18:00	26	46	29.167	120.8	10.45	91.6	6.79	9.5	2.59					
Psyft_I9	2/13/2024	14:50:00	88	130	29.418	117.4	12	102.1	7.01	8.3	3.2					
Psyft_I9	2/21/2024	15:00:00	750	950	29.374	117.7	11.23	94.5	6.89	7.9	7.93					
Psyft_I9	3/12/2024	14:29:00	51	140	29.365	118.7	12.66	107.7	7.1	8.3	8.88					
Psyft_I9	3/26/2024	14:30:00	40	110	29.386	122.9	14.1	130.9	7.36	12	3.02					
Psyft_ST1	1/30/2024	11:47:00	6	6	29.356	124.7	9.68	83.7	6.92	9	1.54	0.015	1.66	0.108	2.19	0.126
Psyft_ST1	2/21/2024	13:27:00	80	96	29.429	136.9	10.97	91.3	7.17	7.4	2.22	0.01	0.974	0.126	1.57	0.157
Psyft_ST1	3/26/2024	11:32:00	6	17	29.48	138.8	11.96	104.4	7.31	9.4	1.24	0.01	0.453	0.0951	1.05	0.136

Psyft_ST1	1/9/2024	12:30:00	630	1100	29.102	112.1	10.7	84.3	6.93	5.3	9.39					
Psyft_ST1	2/13/2024	11:49:00	29	37	29.531	128.8	11.04	91.2	7.16	7.1	1.69					
Psyft_ST1	3/12/2024	12:06:00	31	34	29.377	135.6	11.47	94.4	7.12	7	1.18					
Second_I1	1/9/2024	12:55:00	670	980	29.064	140.9	10.99	86.7	7.11	5.3	10.92					
Second_I1	1/30/2024	12:13:00	69	88	29.283	234	9.96	87.8	7.25	9.7	3.62					
Second_I1	2/13/2024	12:20:00	49	69	29.469	194.3	11.32	97.2	7.43	8.7	2.15					
Second_I1	2/21/2024	13:48:00	300	350	29.378	213.9	10.91	92	7.42	7.9	3.73					
Second_I1	3/12/2024	12:22:00	43	80	29.336	209.2	11.58	96.4	7.42	7.4	1.92					
Second_I1	3/26/2024	12:01:00	31	31	29.424	199.4	10.94	98.2	7.56	10.5	4.68					
Second_I2	1/9/2024	12:59:00	850	1500	29.061	228.6	10.72	84.9	7.16	5.4	9.37					
Second_I2	1/30/2024	12:15:00	6	6	29.277	245.6	9.85	86.7	7.19	9.7	0.97					
Second_I2	2/13/2024	12:25:00	84	120	29.472	264.7	11.28	94.6	7.45	7.7	1.59					
Second_I2	2/21/2024	13:49:00	51	60	29.382	276.5	10.96	92.4	7.48	7.9	1.9					
Second_I2	3/12/2024	12:24:00	14	14	29.327	234.9	12.12	101.8	7.47	7.8	2.63					
Second_I2	3/26/2024	12:03:00	130	130	29.424	260.4	12.82	115	7.81	10.5	1.15					
Second_I3	1/9/2024	13:12:00	790	1300	29.026	268.2	10.36	82.4	7.14	5.6	8.22					
Second_I3	1/30/2024	12:49:00	6	9	29.191	270.1	8.95	78.5	7.03	9.6	0.92					
Second_I3	2/13/2024	13:10:00	66	100	29.418	287.3	10.64	89	7.32	7.6	1.64					
Second_I3	2/21/2024	14:00:00	110	130	29.335	300.7	10.31	86.6	7.27	7.8	2.19					
Second_I3	3/12/2024	12:53:00	80	80	29.303	269	11.31	95.2	7.31	7.8	3.87					
Second_I3	3/26/2024	12:43:00	160	190	29.377	282.2	11.2	100.4	7.52	10.5	1.76					
Second_I4	1/9/2024	13:15:00	920	1200	29.023	272.6	10.35	82.4	7.13	5.5	8.63					
Second_I4	1/30/2024	12:59:00	3	3	29.188	278	8.7	76.4	7.02	9.6	0.96					
Second_I4	2/13/2024	13:14:00	89	92	29.415	292.4	10.48	87.7	7.27	7.6	1.71					
Second_I4	2/21/2024	14:04:00	120	160	29.343	309.7	10.19	85.7	7.26	7.8	2.64					
Second_I4	3/12/2024	12:56:00	96	110	29.312	278.8	11.22	94.2	7.23	7.7	2.04					
Second_I4	3/26/2024	12:49:00	220	230	29.386	289.4	11.23	100.6	7.44	10.4	1.22					
Second_I5	1/9/2024	13:25:00	830	1300	29.014	302.5	10.07	80	7.18	5.5	9.09					
Second_I5	1/30/2024	13:08:00	40	43	29.173	313.5	7.91	69.8	6.96	9.9	0.74					
Second_I5	2/13/2024	13:31:00	110	190	29.401	328.9	10.16	85.9	7.28	8.1	1.87					
Second_I5	2/21/2024	14:12:00	240	240	29.331	366.2	9.84	83.2	7.31	8	2.49					
Second_I5A	3/12/2024	13:07:00			29.3	428.7	12.88	115.7	7.72	10.5	5.44					
Second_I5A	3/26/2024	13:00:00	560	640	29.371	343.8	10.34	92.3	7.47	10.3	1.36					
Second_I5A	3/12/2024	13:10:00	14	20												

Second_I6	1/9/2024	13:28:00	370	410	29.011	380	11.31	89.6	7.46	5.5	11.69					
Second_I6	1/30/2024	13:11:00	23	26	29.161	345.9	11.42	103.2	7.35	10.8	1.13					
Second_I6	2/13/2024	13:29:00	20	26	29.407	376.9	13.31	120.1	7.84	10.8	1.76					
Second_I6	2/21/2024	14:14:00	580	720	29.331	508.4	11.21	96.8	7.67	8.9	6.74					
Second_I6	3/12/2024	13:10:00			29.297	354	10.84	91.3	7.38	7.8	12.11					
Second_I6	3/12/2024	13:07:00	960	1200												
Second_ST1	1/9/2024	12:51:00	1000	1300	29.064	193.6	10.83	85.6	7.13	5.4	9.69					
Second_ST1	1/30/2024	12:11:00	34	37	29.288	240.9	9.82	86.4	7.21	9.7	1.82					
Second_ST1	2/13/2024	12:18:00	71	91	29.48	227.6	11.25	95.2	7.42	8.1	1.9					
Second_ST1	2/21/2024	13:47:00	160	220	29.382	245.7	10.88	91.6	7.41	7.9	2.72					
Second_ST1	3/12/2024	12:20:00	40	43	29.336	224.6	11.73	97.6	7.39	7.4	1.37					
Second_ST1	3/26/2024	11:59:00	92	92	29.424	230.1	11.82	105.4	7.63	10.3	1.64					
Second_ST1A	1/30/2024	12:30:00	11	14	29.28	239.7	10.03	88.1	7.25	9.6	2.42	0.487	6.62	0.452	0.739	0.505
Second_ST1A	2/21/2024	13:12:00	190	230	29.402	249.4	11.14	93.6	7.52	7.8	2.65	0.068	4.08	0.393	6	0.42
Second_ST1A	3/26/2024	12:27:00	54	190	29.445	232.3	11.77	104.9	7.87	10.2	1.5	0.024	1.97	0.344	5.96	0.377
Second_ST1A	1/9/2024	12:15:00	960	1200	29.082	193.6	11.14	88	7.1	5.3	9.75					
Second_ST1A	2/13/2024	12:37:00	29	60	29.504	231.4	11.32	95.4	7.44	7.9	2.09					
Second_ST1A	3/12/2024	12:39:00	37	57	29.365	224.8	11.91	99.3	7.56	7.5	1.53					

Table A2. Dates with total daily precipitation of at least 0.1 inches (data from King County site 44u[6]).

Date	Precipitation (inches)
1/2/2024	0.1
1/3/2024	0.25
1/4/2024	0.11
1/6/2024	0.73
1/7/2024	0.15
1/8/2024	0.53
1/9/2024	0.53
1/10/2024	0.44
1/17/2024	0.44
1/18/2024	0.4
1/20/2024	0.2
1/21/2024	0.64
1/22/2024	0.31
1/23/2024	0.19
1/24/2024	0.47
1/25/2024	0.27
1/26/2024	0.3
1/27/2024	0.44
1/28/2024	0.26
1/31/2024	0.22
2/2/2024	0.21
2/6/2024	0.3
2/9/2024	0.28
2/11/2024	0.32
2/12/2024	0.32
2/20/2024	0.37
2/21/2024	0.36
2/25/2024	0.47
2/28/2024	0.22
2/29/2024	0.87
3/4/2024	0.13
3/12/2024	0.44
3/21/2024	0.19
3/22/2024	0.29
3/23/2024	0.18
3/24/2024	0.11
3/27/2024	0.47

[6] https://green2.kingcounty.gov/hydrology/DataDownload.aspx

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Related Information

- This report is available on the Puyallup Partnership webpage[7].
- Data for this project is available in Ecology's EIM Database,[8] Study ID: EFF_PRT.
- Data is displayed on Puyallup River Tributaries Effectiveness Monitoring StoryMap[9].
- Bacteria data is displayed on Whatcom Conservation District StoryMap[10].

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[7] https://www.ezview.wa.gov/site/alias__1962/37699/puyallup_river_watershed_improvement_project.aspx
[8]https://apps.ecology.wa.gov/eim/search/Eim/EIMSearchResults.aspx?ResultType=EIMStudyTab&StudyUserIdSearchType=Contains&StudyUserIds=EFF_PRT
[9] https://waecy.maps.arcgis.com/apps/MapSeries/index.html?appid=20f291f848cb48fd8c879704f5464461
[10] https://www.arcgis.com/apps/webappviewer/index.html?id=5395274198aa4365b96fbaf01b4db43b&extent=-13894004.8062%2C6045956.0065%2C-13306968.4289%2C6336110.9659%2C102100