

Group 5: Willow Creek (WC) & Deer Creek (DC) – 2023

Emily Berry, Sydney Fagan, Kylie Hill, Adora O’Leary, Sabastian Ortega, Luna Salazar

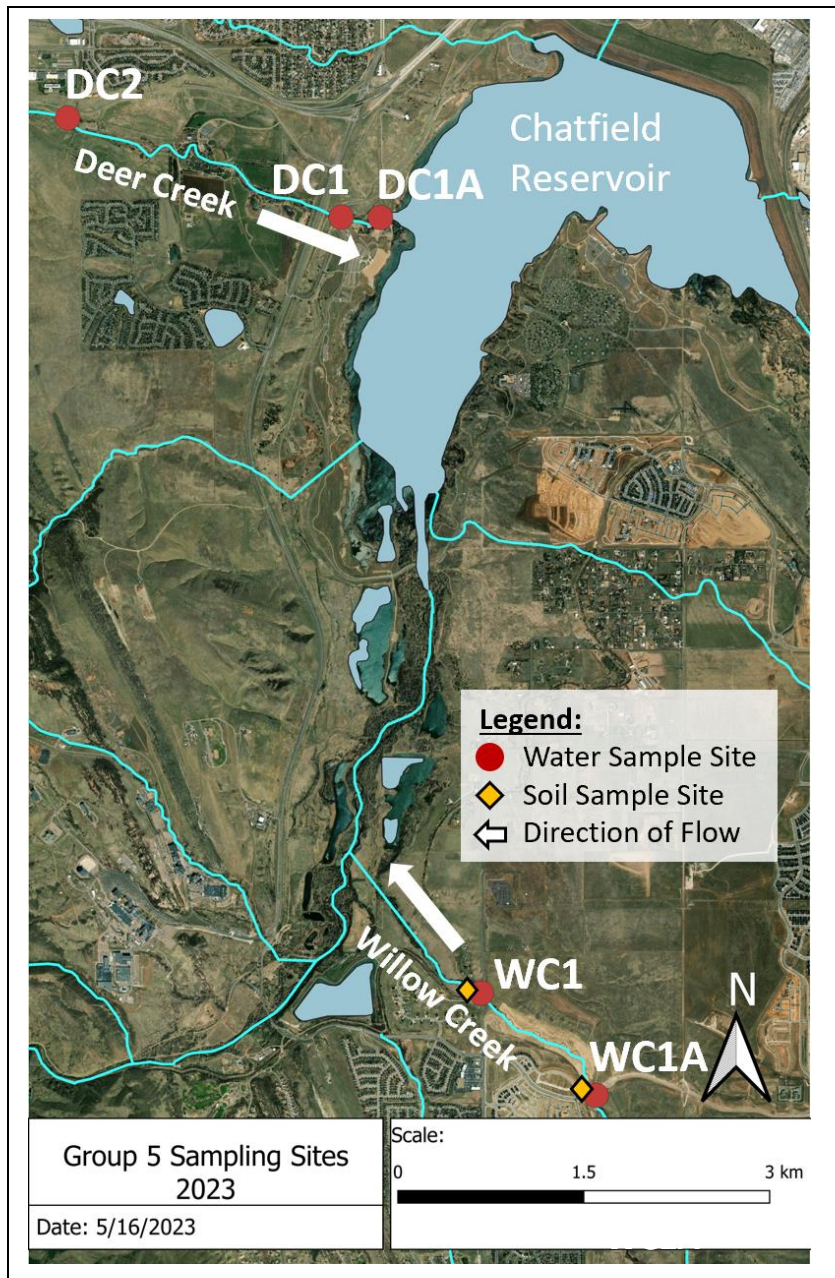


Table 1. Site information

Site ID	Latitude	Longitude	Site Description
DC1	39°32'45.20" N	105°5'11.79" W	DC into Chatfield Reservoir
DC1A	39°32'46.10" N	105°4'56.72" W	Delta at the end of DC into reservoir
DC2	39°33'10.97" N	105°6'44.12" W	DC at Hildebrand Ranch Park
WC1	39°29'23.19" N	105°4'24.47" W	WC under N. Rampart Range Rd
WC1A	39°28'56.54" N	105°3'45.78" W	WC under W. Waterton Rd bridge

Main Findings

- Heavy erosion along DC2, WC1, and WC1A.
- At DC1, total nitrogen levels exceeded at least one of the standards mentioned in Table 3.
- Arsenic levels at WC1 at least doubled from the measurements in 2022, which were below detection levels.
- Selenium levels at WC1 increased by 15% from 2022, doubled from 2021, and were the same as 2020.
- Total nitrogen levels exceeded proposed Regulation 38 at DC1, DC2, and WC1
- Thallium levels in the water and soil leachate at WC1A exceeded set regulations-it is possible this is due to the residential development directly above and adjacent to the site.
- Phosphorous exceeded regulations values in both soil leachate samples but was below the detection limit for all water samples, demonstrating that any phosphorus seen in the samples may be coming from the sediment.

Table 2. Measured water quality parameters and flow rates

Date	Site ID	pH*	Conductivity (µs/cm)	Temp** (°C)	Alkalinity* (mg CaCO ₃ /L)	DO (mg/L)	Turbidity (NTU)	Flow Rate (cfs)
5/16/2023	DC1	7.53	284	14.4	45.1	9.03	79.9	91.8
5/16/2023	DC1A	8.11	432	N/M	92.9	8.27	13.4	N/M
5/16/2023	DC2	7.56	505	13.3	33.1	9.06	111	93.3
5/16/2023	WC1	8.24	976	22.2	162	7.46	49.4	5.23
5/16/2023	WC1A	7.94	1370	27.9	225	7.03	9.04	N/M

N/M = Not Measured; *Standard limit 6.5 to 9 [4]; **Daily Max 24.3°C;

▲Standard min 6.0 mg/L [4]; *Standard limit 20 mg CaCO₃/L [1], Flow rates are from measurements taken on 5/19/23

Figure 1. Site Map

Table 3. Metals, anions, solids, organics, nutrients, and pathogens

2023 Group 5 – Deer and Willow Creek			Concentrations												
			Metals (mg/L)					Anions (mg/L)		Solids (mg/L)	Organics (mg/L)	Nutrients (mg/L)		Pathogens (mpn/100 mL)	
			As	Fe	Mn	Se	TI	NO ₂ ⁻ as N	NO ₃ ⁻ As N	TSS	TOC	P	TN	Coliform	<i>E. coli</i>
EPA	Aquatic Life Chronic [1]		0.15	1.0	-	-	-	-	-	-	-	-	-	-	
	Aquatic Life Acute [1]		0.34	-	-	-	-	-	-	-	-	-	-	-	
	Human Recreation [2]		1.8E-05	-	0.05	0.17	2.4E-04	-	10	-	-	-	-	-	
	Drinking Water [3]		0.01	-	-	0.05	0.002	1	10	-	-	-	-	-	
	Secondary Drinking Water [3]		-	0.3	0.05	-	-	-	-	-	-	-	-	-	
CDPHE	Regulation 38 Chronic [4]		2.0E-05*	1.0*	1.7**	0.0046	-	0.05	-	-	-	0.11 [▲]	0.53 [•]	-	126
	Regulation 38 Acute [4]		0.34	-	3.1**	0.0184	-	-	10	-	-	-	-	-	
USDA	USDA Livestock [5]		0.01	0.3	0.05	0.05	-	10	30	-	-	-	-	200	-
Detection Limit (mg/L)			0.0168	0.0003	0.0001	0.0109	0.0049	0.1	0.1	-	0.17	0.029	0.17	1	1
Sample	Site ID	Date	As	Fe	Mn	Se	TI	NO ₂ ⁻ as N	NO ₃ ⁻ as N	TSS	TOC	P	TN	Coliform	<i>E. coli</i>
Water	DC1	5/16/2023	BDL	0.232	0.017	BDL	BDL	0.031	0.72	271	14.7	BDL	1.34	BDL	BDL
	DC1A	5/16/2023	BDL	0.035	0.024	BDL	BDL	0.170	0.08	16	5.23	BDL	0.37	14.8	1.0
	DC2	5/16/2023	BDL	0.171	0.012	BDL	BDL	0.032	0.81	44.7	13.6	BDL	1.45	19.3	10.9
	WC1	5/16/2023	0.030	0.003	0.081	0.03	BDL	BDL	1.25	271	4.58	BDL	1.79	146	98
	WC1A	5/16/2023	0.032	0.001	0.005	0.025	0.008	BDL	0.08	2	3.36	BDL	0.46	9.1	BDL
Soil	WC1	5/16/2023	0.018	0.035	0.154	0.011	BDL	BDL	0.60	N/M	N/M	0.122	N/M	N/M	N/M
	WC1A	5/16/2023	0.033	0.003	0.200	0.064	0.007	BDL	9.71	N/M	N/M	0.129	N/M	N/M	N/M
Notes: A/BDL = Above/Below Detection Limit N/M = Not Measured *Total Recoverable Standards (all other standards are for dissolved metals) **Calculated using Table Value Standards assuming 111 mg CaCO ₃ /L average low flow hardness [6] ▲Phosphorus standard is 0.03 mg/L within Chatfield Reservoir and 0.11 mg/L for most tributaries •Average of Regulation 38 proposed standards for cold and warm waters Bold values represent total metal concentrations. All other concentrations are dissolved. For information on other constituents, please see Data Appendix							[1] US EPA National Recommended Water Quality Criteria - Aquatic Life Criteria Table; freshwater standards (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table) [2] US EPA National Recommended Water Quality Criteria - Human Health Criteria Table; consumption of water & organisms (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table) [3] US EPA Drinking Water (https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations) [4] CDPHE Regulation 38 for Upper South Platte River Basin (https://cdphe.colorado.gov/water-quality-control-commission-regulations) [5] USDA Livestock Drinking Water (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_051302.pdf) [6] Chatfield Reservoir Storage Reallocation Feasibility Study 2013								

<p>Recommendations</p> <ul style="list-style-type: none"> Monitoring of total nitrogen and nitrite levels entering and in Chatfield Reservoir to reduce the risk of harmful algae blooms. Erosion mitigation measures to prevent phosphorus from entering the water bodies through phosphorus-rich soil. 	<ul style="list-style-type: none"> Install a stream gage on DC2 to monitor flow levels, and therefore loading amounts, into the reservoir. Private well monitoring in Sterling Ranch to ensure arsenic and selenium levels are kept below drinking water standards.
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