

Stream Water Chemistry Report Summary

Stream Name: Judges Creek

Water Chemistry Parameters	Observed Value					Standard
	2013	2014	2015	2016	2017	
Total Suspended Solids (mg/L)	38.91 ± 5.83	28.70 ± 6.30	22.22 ± 21.55	25.00 ± 17.28	15.81 ± 7.84	< 8.9
Alkalinity (mg/L)	237.50 ± 9.69	241.67 ± 10.47	264.57 ± 20.14	224.79 ± 61.05	257.00 ± 22.98	> 130
Chloride (mg/L)	7.09 ± 0.81	9.27 ± 0.88	7.94 ± 1.73	8.01 ± 3.54	6.86 ± 2.36	
Total Phosphorus (mg/L)	0.05 ± 0.02	0.07 ± 0.02	0.04 ± 0.02	0.06 ± 0.03	0.06 ± 0.09	< 0.01 - 0.03
Chlorophyll a Content (mg/L)	0.75 ± 0.12	0.72 ± 0.13	1.73 ± 1.23	4.03 ± 2.89	2.29 ± 1.17	
Temperature (°C)	14.20 ± 1.56	12.46 ± 1.56	14.30 ± 2.41			< 25.15
pH	7.93 ± 0.19	7.84 ± 0.12	7.82 ± 0.34			Between 6.5-8.5
Conductivity (spc)	0.35 ± 0.03	0.47 ± 0.03	0.53 ± 0.15			
Dissolved Oxygen (mg/L)	7.17 ± 0.58	7.95 ± 0.55	8.70 ± 2.26			> 6.0
Total Organic Nitrogen (mg/L)	0.58 ± 0.07	0.66 ± 0.07	0.48 ± 0.18	0.76 ± 0.31	0.56 ± 0.14	< 1.1
Caffeine (µg/L)			0.0003			

There has been a statistically significant decline in total suspended solids at Judges Creek over the past five years ($P = 0.020$), with total suspended solids values decreasing by 60% between 2013 and 2017. The most notable decline between years occurred between 2016 and 2017, with total suspended solids values dropping by 37%. These water quality trends strongly reflect the cattle exclusion efforts in this watershed, which notably intensified between the 2016 and 2017 sampling campaigns. If these trends continue, the total suspended solids values for this site are likely to meet water quality guidelines for the first time since the monitoring program was initiated.

In contrast with the total suspended solids data, there has been no significant or even trending decline in total phosphorus or total organic nitrogen values at Judges Creek over the past five years. This is despite over 2700 cattle being excluded from this creek and its tributaries since 2013. That said, exclusion efforts only began in earnest at this site in 2015. As lag times between remediation efforts and effects are commonly observed in agricultural systems, it is possible we will yet see a decline in P or

N. It is also possible that, despite the cattle being physically excluded from the stream sites, their wastes are still being carried over land into the creek via precipitation events.

Chlorophyll a levels have significantly increased at the study site since cattle exclusion started in 2015 ($P < 0.001$). There has been a 205% increase between 2013 and 2017, with the highest chlorophyll a values observed during the 2016 summer season. The rising levels of chlorophyll a content in the creek may be due to sustained nutrient loading paired with increased light penetration into the creek. As the cattle are excluded they introduce less sediment into the stream, which results in clearer waters that support greater light penetration. Increased light availability in the stream column paired with sustained nitrogen and phosphorus levels could increase nuisance vegetation growth as indicated by chlorophyll a content. If a remediation goal for Judges Creek is to ultimately reduce nuisance plant growth, additional measures may be needed to target and limit nutrient loading at this site.