Stream Water Chemistry Report Summary

Stream Name: Swan Lake Drain

Water Chemistry Parameters	Observed Value					Standard
	2013	2014	2015	2016	2017	
Total Suspended Solids (mg/L)	7.33 ± 1.80	6.17 ± 1.67	17.22 ± 29.25	12.14 ± 10.93	4.39 ± 4.02	< 8.9
Alkalinity (mg/L)	252.67 ± 18.49	224.14 ± 17.12	263.44 ± 51.81	231.86 ± 34.22	207.30 ± 23.28	> 130
Chloride (mg/L)	7.97 ± 1.45	10.57 ± 1.37	186.76 ± 504.46	11.60 ± 17.92	5.18 ± 3.58	
Total Phosphorus (mg/L)	0.03 ± 0.004	0.02 ± 0.004	0.12 ± 0.24	0.04 ± 0.03	0.03 ± 0.01	< 0.01 - 0.03
Chlorophyll a Content (mg/L)	0.54 ± 0.12	0.37 ± 0.12	2.19 ± 2.53	9.91 ± 11.23	2.06 ± 0.88	
Temperature (°C)	16.38 ± 2.75	11.28 ± 2.51	15.55 ± 3.59			
pH	8.23 ± 0.39	7.88 ± 0.12	7.67 ± 0.49			Between 6.5-8.5
Conductivity (spc)	0.400 ± 0.10	0.491 ± 0.09	1.356 ± 2.21			
Dissolved Oxygen (mg/L)	6.90 ± 1.06	8.81 ± 0.97	7.79 ± 4.20			> 6.0
Total Organic Nitrogen (mg/L)	0.76 ± 0.09	0.59 ± 0.08	1.11 ± 1.46	0.95 ± 0.47	0.67 ± 0.12	< 1.1
Caffeine (µg/L)			0.0158			

Since cattle exclusion efforts began in 2015 at Swan Lake Drain we have observed a trending but non-statistically significant decline in total suspended solids (P = 0.4615). We did observe statistically significant declines in total suspended solids at Judges Creek and Stokes River, however these sites have had an order of magnitude more cattle excluded in the past five years. Moreover, as of 2017 the total suspended solids values at Swan Lake Drain are well within guideline conditions, and approaching the levels observed in the reference stream (Black Creek).

We have not observed a statistically significant or even trending decline in total phosphorus or total organic nitrogen at this site. There has been notable year-to-year variation in both the phosphorus and nitrogen measures with peak values reported in 2015 and 2016. During both of those years major precipitation events occurred, which appears to have strongly increased nutrient loading into Swan Lake Drain. The high nutrients levels coincide with elevated chlorophyll a content, an indicator of nuisance plant growth in the stream. Accordingly, we observed strong regressive relationships between

chlorophyll a growth and total phosphorus ($P < 0.001$; $R^2 = 0.62$) as well as total organic nitrogen ($P < 0.001$; $R^2 = 0.54$). The R^2 values we observed indicates that approximately 62% and 54% of the variation in the chlorophyll a dataset can be explained by total phosphorus and total organic nitrogen values respectively. Accordingly, we can expect chlorophyll a production to strongly decrease at this site if annual average nutrient loading from cattle wastes or other sources were to have a sustained decline.