

## Stream Water Chemistry Report Summary

Stream Name: Stokes River

Water Chemistry Parameters	Observed Value					Standard
	2013	2014	2015	2016	2017	
<b>Total Suspended Solids (mg/L)</b>	14.43 ± 3.33	7.62 ± 3.33	4.87 ± 2.33	6.93 ± 4.81	4.39 ± 4.02	< 8.9
<b>Alkalinity (mg/L)</b>	207.67 ± 9.42	181.08 ± 9.42	203.31 ± 35.66	194.43 ± 23.24	207.31 ± 23.28	> 130
<b>Chloride (mg/L)</b>	5.24 ± 1.36	7.25 ± 1.30	5.68 ± 4.69	10.02 ± 10.26	5.18 ± 3.58	
<b>Total Phosphorus (mg/L)</b>	0.05 ± 0.006	0.03 ± 0.006	0.04 ± 0.024	0.04 ± 0.010	0.03 ± 0.010	< 0.01 - 0.03
<b>Chlorophyll a Content (mg/L)</b>	1.51 ± 0.41	0.40 ± 0.33	1.51 ± 1.17	3.86 ± 2.20	2.06 ± 0.88	
<b>Temperature (°C)</b>	15.31 ± 2.18	13.52 ± 1.63	15.71 ± 3.45			
<b>pH</b>	8.04 ± 0.11	7.79 ± 0.11	7.82 ± 0.21			Between 6.5-8.5
<b>Conductivity (spc)</b>	0.323 ± 0.02	0.379 ± 0.02	0.359 ± 0.09			
<b>Dissolved Oxygen (mg/L)</b>	7.52 ± 0.58	7.88 ± 0.44	8.48 ± 2.40			> 6.0
<b>Total Organic Nitrogen (mg/L)</b>	0.70 ± 0.06	0.66 ± 0.56	0.53 ± 0.13	0.84 ± 0.21	0.67 ± 0.12	< 1.1
<b>Caffeine (µg/L)</b>			0.012 ± 0.004			

There is clear evidence of improved water quality at Stokes River. Over the past five years there has been a statistically significant decline in total suspended solids at this site ( $P = 0.013$ ), with 2017 values 70% lower than 2013 values. As such, the total suspended solids values at this site have been brought within guideline levels and are approaching the levels observed at the reference stream (Black Creek). This decline in total suspended solids reflects the cattle exclusion efforts at this site, which were most intense between the 2013 and 2014 sampling campaigns. These improvements in water quality are good news for the stream invertebrates and fish species that utilize this watershed, as they can suffer deleterious effects from elevated suspended solids in the water column.

The total phosphorus and total organic nitrogen levels at Stokes River have not declined. While there has been variance from year-to-year for both measures, there is no statistically significant or trending decrease for either. Considering that the caffeine measured during the 2015 growing season were approximately the same as the reference stream, it is unlikely human wastes are entering the stream in

quantities sufficient to drive nutrient trends. Instead, it is more likely cattle wastes on land are still being carried to the stream during precipitation events.

The sustained levels of total phosphorus are a particular issue for Stokes River site. This stream has a significant and positive relationship between total phosphorus levels and chlorophyll a content (an indicator of nuisance vegetation growth;  $P = 0.043$ ), a relationship that was not found between total organic nitrogen and chlorophyll a. This indicates that variation in total phosphorus values at this site are a stronger driver of chlorophyll a levels than total organic nitrogen; however, the  $R^2$  of this relationship is only 0.07. This means that total phosphorus values are only able to explain approximately 7% of the variation in the chlorophyll a production, the other 93% of the variation is explained by other factors.