

Changes in White Lake Nutrients Over Time

The first White Lake sampling in which nutrients were analyzed was the statewide comparative study by Weiss and Kuenzler (1976). Sampling by NC DEQ/DENR began in 1998 and has been conducted in summer months on a five-year rotation (as part of the Cape Fear Basin lake and reservoir sampling program). In 2008, this monitoring did not include nutrients, so there was a ten-year data gap. **Total Nitrogen and pH were the two parameters which changed substantially over that period (2003-2013** [see circled values in the data table below]). Total Nitrogen has continued to increase, so that present-day TN/TP mass ratios are much higher than what was found in 1974 and are very similar to the TN/TP mass ratios of rainfall (measured in Feb.-Apr. 2020; mean rainfall TN/TP = 27.7).

Total Nitrogen and Total Phosphorus includes nutrients within algal cells, so there is some association between algal biomass and TN and TP; however, comparing the similar algal biomass (chlorophyll *a*) between June 2003 and June 2019, the mean TN values in 2019 show a four-fold increase.

Cyanobacterial Bloom and Treatment Effects on Nutrients

A filamentous cyanobacterial bloom developed in September 2017 and persisted into 2018, and a low-dose alum treatment was applied in early May 2018; mean TP prior to the treatment was 0.06 mg/L (NCDEQ 2019), while mean TN was 1.3 mg/L and mean chlorophyll *a* (algae biomass) was 52 µg/L (Envirochem/LIMNOSCIENCES 2018).

White Lake nutrient levels in late June 2018 (six weeks post-treatment) were more than 60% lower than pre-treatment levels, and more in line with what they had been before the cyanobacterial bloom began: mean TN=0.50 mg/L (Envirochem/LIMNOSCIENCES 2018), and mean TP=0.02 mg/L (NCDEQ 2019).

A Comparison of White Lake Monitoring Data for June, From 1974-2020

	6/6/74	6/16/98	6/10/03	6/17/2013	6/29/2017	6/27/2018	6/23/2019	6/23/20
Mean Temperature (C)	26.1	28.3	27.6	27.5	28.6	30.2	29.0	27.5
Water Clarity, as Secchi Depth (m)	>3.0	2.4	2.6	2.8	1.2	1.75	>3.0	1.25
Mean Algal Abundance, as Chlorophyll <i>a</i> (µg/L)			5	2.5	10.7	8	5.5	6.4
pH Range (std. units)	4.6	4.2-4.3	4.2	6.0-6.8	6.5-7.4	6.6-7.3	6.2-6.7	7.1-7.3
Dissolved Oxygen, mg/L	8.6	7.2	8.0	7.0 (89% sat)	7.3 (95% sat)	7.6 (99% sat)	7.9 (103% sat)	8.6 (109% sat)
Mean Total Nitrogen (mg/L)	0.211	0.11	0.11	0.39	0.68	0.50	0.481	0.757
Mean Total Phosphorus (mg/L)	0.017	<0.01	<0.02	<0.02	0.02	0.02*	0.014	0.025
TN/TP (mass)	12.4				34	25	34.4	30.3
Number of Samples	1	3	3	3	7	7	6	6

Data Sources for Table:

Envirochem/LIMNOSCIENCES. 2018. White Lake, NC 2018 Monitoring Program Report to the Town of White Lake. Asterisk indicates TP data from NCDEQ, as Envirochem detection limits were 0.04 mg/L

LIMNOSCIENCES. 2019. White Lake, NC 2019 Monitoring Program Report to the Town of White Lake. Available at www.whitelakewatch.com

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North Carolina Department of Environment and Natural Resources. 2014. Lake and Reservoir Assessments, Cape Fear River Basin. Water Sciences Section, Intensive Survey Branch.

North Carolina Division of Environmental Quality. 2018. 2017 White Lake Water Quality Investigation. White Lake, Bladen County (Cape Fear Basin). Division of Water Resources Water Sciences Section.

North Carolina Division of Environmental Quality. 2019. 2018 White Lake Monitoring Report. White Lake, Bladen County, NC. Division of Water Resources Water Sciences Section.

Weiss, C.M., and E.J. Kuenzler. 1976. The trophic state of North Carolina lakes. Water Resources Research Institute of the University of North Carolina Report Number 119.

White Lake QAPP. 2019. Available at www.whitelakewatch.com