Florida LAKEWATCH Report for Quarry in Collier 2024

Introduction for Lakes

This report summarizes data collected on systems that have been part of the LAKEWATCH program. Data are from the period of record for individual systems. Part one allows the comparison of data with Florida Department of Environmental Protection's Numeric Nutrient Criteria. Part two allows a comparison of the long-term mean nutrient concentrations with nutrient zone concentrations published by LAKEWATCH staff (Bachmann et al. 2012; https://lakewatch.ifas.ufl.edu/resources/bibliography/). Finally, this report examines data for long-term trends that may be occurring in individual systems but only for systems with **five or more years of data**. For more information about the study of Florida waters, please see our series of information circulars "A Beginner's Guide to Water Management" (https://lakewatch.ifas.ufl.edu/extension/information-circulars/).

Part 1: Florida Department of Environmental Protection (FDEP) Nutrient Criteria for Lakes (Table 1)

For lakes, the numeric interpretations of the nutrient criterion in paragraph 62-302.530(47)(b), F.A.C., based on chlorophyll are shown in Table 1. The applicable interpretations for TN and TP will vary on an annual basis, depending on the availability and concentration of chlorophyll data for the lake. The numeric interpretations for TN, TP, and chlorophyll shall not be exceeded more than once in any consecutive three year period.

- a. If annual geometric mean chlorophyll does not exceed the chlorophyll value for one of three lake classification groups listed in the table below, then the TN and TP numeric interpretations for that calendar year shall be the annual geometric means of the maximum calculated numeric interpretation in Table 1.
- b. If there are insufficient data to calculate the annual geometric mean chlorophyll for a given year or the annual geometric mean chlorophyll exceeds the values in Table 1 for the correct lake classification group, then the applicable numeric interpretations for TN and TP shall be the minimum values in Table 1.

Long-Term Data Summary for Lakes (Table 2): Definitions

- Total Phosphorus (μg/L): Nutrient most often limiting growth of plant/algae.
- Total Nitrogen (μg/L): Nutrient needed for aquatic plant/algae growth but only limiting when nitrogen to phosphorus ratios are generally less than 10 (by mass).
- Chlorophyll-uncorrected (μg/L): Chlorophyll concentrations are used to measure relative abundances of open water algae.
- Secchi (ft), Secchi (m): Secchi measurements are estimates of water clarity.
- Color (Pt-Co Units): LAKEWATCH measures true color, which is the color of the water after particles have been filtered out.
- Specific Conductance (μS/cm @ 25 C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as CaCO3 or specific conductance less than or equal to 100 µs/cm @25 C), and clear hard water lakes (color less than 40 Pt-Co units and alkalinity greater than 20 mg/L as CaCO3 or specific conductance greater 100 µS/cm @ 25 C).

Table 1. Florida Department of Environmental Protection's Numeric Nutrient Criteria for lakes.

Long Term Geometric	Annual	Minimum calculated		Maximum calculated	
Mean Lake Color and Long-	Geometric	numeric interpretation		numeric interpretation	
Term Geometric Mean	Mean	Annual	Annual	Annual	Annual
Color, Alkalinity and	Chlorophyll-	Geometric	Geometric	Geometric	Geometric
Specific Conductance	corrected	Mean Total	Mean Total	Mean Total	Mean Total
		Phosphorus	Nitrogen	Phosphorus	Nitrogen
> 40 Platinum Cobalt Units	20 μg/L	50 μg/L	1270 μg/L	160 μg/L ¹	2230 μg/L
Colored Lakes					
≤ 40 Platinum Cobalt Units					
and > 20 mg/L CaCO ₃	20 μg/L	30 μg/L	1050 μg/L	90 μg/L	1910 μg/L
or					
>100 μS/cm@25 C					
Clear Hard Water Lakes					
≤ 40 Platinum Cobalt Units					
and ≤ 20 mg/L CaCO ₃	6 μg/L	10 μg/L	51 μg/L	30 μg/L	930 μg/L
or					
< 100 μS/cm@25 C					
Clear Soft Water Lakes					

 $^{^{1}}$ For lakes with color > 40 PCU in the West Central Nutrient Watershed Region, the maximum TP limit shall be the 490 μ g/L TP streams threshold for the region.

For the purpose of subparagraph 62-302.531(2)(b)1., F.A.C., color shall be assessed as true color and shall be free from turbidity. Lake color and alkalinity shall be the long-term geometric mean, based on a minimum of ten data points over at least three years with at least one data point in each year. If insufficient alkalinity data are available, long-term geometric mean specific conductance values shall be used, with a value of $<100 \, \mu \text{S/cm}@25 \, \text{C}$ used to estimate the mg/L CaCO₃ alkalinity concentration until such time that alkalinity data are available.

Table 2. Long-term trophic state data collected monthly by LAKEWATCH volunteers and classification variables color and specific conductance (collected quarterly). Values in bold can be used with Table 1 to evaluate compliance with nutrient criteria.

Parameter	Minimum Annual Geometric Means	Maximum Annual Geometric Means	Grand Geometric Mean	n
Total Phosphorus (μg/L)	3	114	9	9
Total Nitrogen (μg/L)	500	1350	762	9
Chlorophyll- uncorrected (µg/L)	0	17	3	9
Secchi (ft)	4	13	7	9
Secchi (m)	1.2	3.9	2.1	9
Color (Pt-Co Units)	15	364	37	9
Specific Conductance (μS/cm@25 C)	250	348	289	9
Lake Classification	Clear Hard Water			

Interpreting FDEP's Numeric Nutrient Criteria (NNC): These are instructions for using Table 1 and 2 to determine impairment status based on FDEP's NNC.

- 1. Identify your lake's *Lake Classification* in Table 2 (Colored, Clear Hard Water, or Clear Soft Water) (if no classification is listed then there is not enough data available to classify your lake).
 - a. The Lake Classification tells you which row to use in Table 1.
- 2. Identify your waterbody's Grand Geometric Mean Chlorophyll-uncorrected in Table 2.
 - a. Compare this number to the Annual Geometric Mean Chlorophyll-corrected (2^{nd} column) in Table 1.
 - b. If your lake's Chlorophyll-uncorrected concentration is greater than the *Annual Geometric Mean Chlorophyll-corrected* concentration use the *Minimum calculated numeric interpretation* columns.
 - c. If your lake's Chlorophyll-uncorrected concentration is less than the Annual Geometric Mean Chlorophyll-corrected concentration use the Maximum calculated numeric interpretation columns.
- 3. Identify your lake's Total Phosphorus and Total Nitrogen *Grand Geometric Mean* concentration in Table 2 and compare them to the appropriate *Annual Geometric Mean Total Phosphorus* and *Annual Geometric Mean Total Nitrogen* values in Table 1.
- 4. If your lake's concentrations from Table 2 are greater than FDEP's NNC values from Table 1, your lake may be considered impaired. If they are below, it may be considered unimpaired.

Base File Data for Lakes: Definitions

- County: Name of county in which the system resides.
- Name: Stream name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- Water Body Type: Four different types of systems; lakes, estuaries, river/streams and springs.
- Period of Record (years): Number of years a system has been in the LAKEWATCH program.
- Latitude and Longitude: Coordinates identifying the exact location of station 1 for each system.
- Water Body Type: Four different types of systems; lakes, estuaries, river/streams and springs.
- Surface Area (ha and acre): LAKEWATCH lists the surface area of a lake if it is available.
- Mean Depth (m and ft): This mean depth is calculated from multiple depth finder transects across a lake that LAKEWATCH uses for estimating plant abundances.
- Period of Record (year): Years a lake has been in the LAKEWATCH program.
- TP Zone and TN Zone: Nutrient zones defined by Bachmann et al (2012).
- Long-Term TP and TN Geometric Mean Concentration (μg/L: min and max): Grand Geometric Means of all annual geometric means (μg/L) with minimum and maximum annual geometric means.
- Lake Trophic Status (CHL): Tropic state classification using the long-term chlorophyll average.

Table 3. Base File Data, long-term nutrient grand geometric means and Nutrient Zone classification listing the 90th percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Collier
Name	Quarry
GNIS Number	NA
Latitude	26.287
Longitude	-81.6786
Water Body Type	Lake
Surface Area (ha and acre)	. ha, . acres
Period of Record (year)	2013 to 2021
Lake Tophic Status (CHL)	Oligotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (ug/ L, min, and max.)	9 (6 to 13)
TN Zone	TN4
Grand TN Geometric Mean Concentration (ug/ L, min, and max.)	762 (703 to 831)

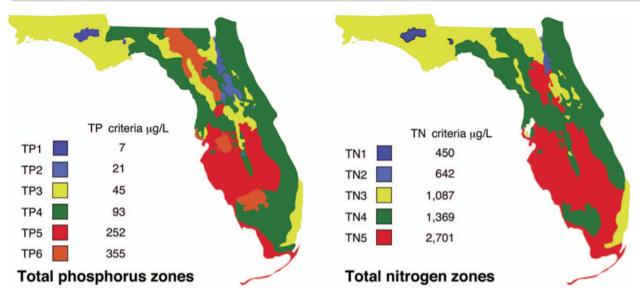


Figure 1. Maps showing Florida phosphorus and nitrogen zones and the nutrient concentrations of the upper 90% of lakes within each zone (Bachmann et al. 2012).

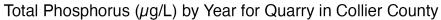
Nutrient Zones and "Natural Background"

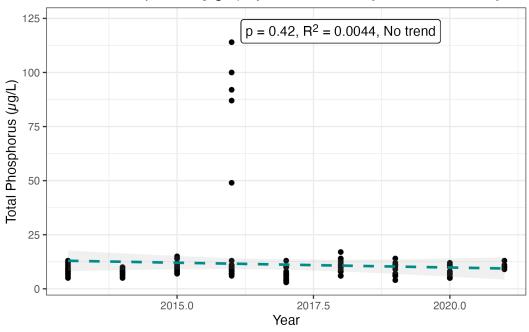
Administrative code definitions 62-302.200 (19): "Natural background" shall mean the condition of waters in the absence of man-induced alterations based on the best scientific information available to the Department. The establishment of natural background for an altered waterbody may be based upon a similar unaltered waterbody, historical pre-alteration data, paleolimnological examination of sediment cores, or examination of geology and soils. When determining natural background conditions for a lake, the lake's location and regional characteristics as described and depicted in the U.S. Environmental Protection Agency document titled Lake Regions of Florida (EPA/R-97/127, dated 1997, U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Corvallis, OR) (http://www.flrules.org/Gateway/reference.asp?No=Ref-06267),) which is incorporated by reference herein, shall also be considered. The lake regions in this document are grouped into Nutrient Zones according to ambient total phosphorus and total nitrogen concentrations listed in Table 1 found in Bachmann, R. W., Bigham D. L., Hoyer M. V., Canfield D. E, Jr. 2012. A strategy for establishing numeric nutrient criteria for Florida lakes. Lake Reservoir Management. 28:84-92.

Part 2: Interpreting Florida LAKEWATCH's Nutrient Zones: These are instructions for using Table 3 and Figure 1 to determine nutrient status based on Nutrient Zones.

- 1. Identify your lake's TP Zone in Table 3.
 - a. Locate this TP Zone (left map) and its corresponding nutrient concentration in Figure 1.
- 2. Locate your lake's Long-Term Grand Geometric Mean TP Concentration value in Table 3.
- 3. Compare your lake's Long-Term Grand Geometric Mean TP Concentration from Table 3 to the appropriate TP Zone nutrient concentration from Figure 1.
 - a. If your lake's Long-Term Grand Geometric Mean TP Concentration number is higher than the TP zone nutrient concentration, your lake's nutrient concentration is above "Natural Background".
 - b. If your lake's Long-Term Grand Geometric Mean TP Concentration number is lower than the TP zone nutrient concentration, your lake's nutrient concentration is within "Natural Background".
- 4. Repeat these same steps with the TN Zone and Long-term Grand Geometric Mean TN Concentration. #

Figure 2 and Figure 3. Trend plots of total phosphorus and total nitrogen versus year. The $\rm R^2$ value indicates the strength of the relations (ranges from 0.0 to 1.0; higher the R2 the stronger the relation) and the p value indicates if the relation is significant (p < 0.05 is significant). Trend Status are reported on plots as Increasing, Decreasing, or No Trend.





Total Nitrogen (µg/L) by Year for Quarry in Collier County

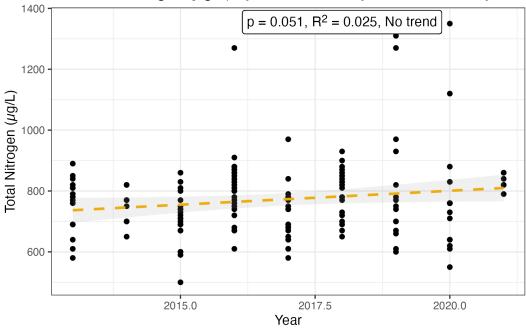
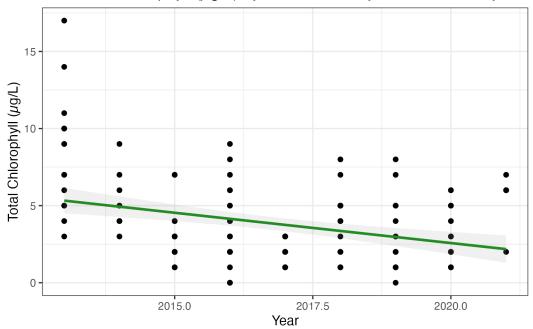


Figure 4 and Figure 5. Trend plots of total phosphorus and total nitrogen versus year. The R^2 value indicates the strength of the relations (ranges from 0.0 to 1.0; higher the R^2 the stronger the relation) and the p value indicates if the relation is significant (p < 0.05 is significant). Trend Status are reported on plots as Increasing, Decreasing, or No Trend.

Total Chlorophyll (μ g/L) by Year for Quarry in Collier County



Secchi Depth (ft) by Year for Quarry in Collier County

