#### Florida LAKEWATCH Report for Asbury North in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	12 - 30	17 (17)
Total Nitrogen (µg/L)	328 - 615	424 (17)
Chlorophyll- uncorrected (µg/L)	2 - 25	5 (17)
Secchi (ft)	4.7 - 10.9	8.2 (17)
Secchi (m)	1.4 - 3.3	2.5 (17)
Color (Pt-Co Units)	8 - 21	13 (9)
Specific Conductance (µS/cm@25 C)	107 - 121	112 (3)
Lake Classification	<b>Clear Hardwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Asbury North
GNIS Number	1867111
Latitude	30.0616
Longitude	-81.8188
Water Body Type	Lake
Surface Area (ha and acre)	69 ha or 171 acre
Period of Record (year)	1993 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	17 (12 to 30)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	424 (328 to 615)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Asbury North trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.43$ , p = 0.00), total nitrogen (TN Increasing,  $R^2 = 0.45$ , p = 0.00), chlorophyll (CHL Increasing,  $R^2 = 0.42$ , p = 0.01) and Secchi depth (Secchi No Trend,  $R^2 = 0.13$ , p = 0.15).



#### Florida LAKEWATCH Report for Asbury South in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	13 - 21	15 (13)
Total Nitrogen (µg/L)	338 - 675	449 (13)
Chlorophyll- uncorrected (µg/L)	4 - 13	6 (13)
Secchi (ft)	5.1 - 12.3	7.8 (13)
Secchi (m)	1.5 - 3.8	2.4 (13)
Color (Pt-Co Units)	8 - 22	13 (4)
Specific Conductance (µS/cm@25 C)	88 - 116	105 (3)
Lake Classification	<b>Clear Hardwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Asbury South
GNIS Number	1867111
Latitude	30.0433
Longitude	-81.8168
Water Body Type	Lake
Surface Area (ha and acre)	18.5 ha or 46 acre
Period of Record (year)	1993 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	15 (13 to 21)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	449 (338 to 675)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Asbury South trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.28$ , p = 0.06), total nitrogen (TN Increasing,  $R^2 = 0.39$ , p = 0.02), chlorophyll (CHL Increasing,  $R^2 = 0.47$ , p = 0.01) and Secchi depth (Secchi No Trend,  $R^2 = 0.34$ ).



#### Florida LAKEWATCH Report for Brooklyn in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	7 - 39	14 (16)
Total Nitrogen (µg/L)	157 - 810	332 (16)
Chlorophyll- uncorrected (µg/L)	2 - 19	6 (16)
Secchi (ft)	1.2 - 14.5	5.4 (16)
Secchi (m)	0.4 - 4.4	1.7 (16)
Color (Pt-Co Units)	7 - 17	12 (7)
Specific Conductance (µS/cm@25 C)	47 - 47	47 (1)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Brooklyn
GNIS Number	308442
Latitude	
Longitude	
Water Body Type	Lake
Surface Area (ha and acre)	297 ha or 734 acre
Period of Record (year)	1989 to 2007
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (7 to 39)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	332 (157 to 810)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Brooklyn trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.32$ , p = 0.02), total nitrogen (TN Increasing,  $R^2 = 0.39$ , p = 0.01), chlorophyll (CHL No Trend,  $R^2 = 0.18$ , p = 0.10) and Secchi depth (Secchi No Trend,  $R^2 = 0.08$ , p = 0.29).



#### Florida LAKEWATCH Report for Brooklyn Bay in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	7 - 22	12 (20)
Total Nitrogen (µg/L)	198 - 474	326 (20)
Chlorophyll- uncorrected (µg/L)	2 - 13	5 (20)
Secchi (ft)	2.5 - 12.8	7.5 (20)
Secchi (m)	0.8 - 3.9	2.3 (20)
Color (Pt-Co Units)	9 - 16	11 (8)
Specific Conductance (µS/cm@25 C)	33 - 40	35 (6)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Brooklyn Bay
GNIS Number	279438
Latitude	29.7946
Longitude	-82.0190
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1989 to 2018
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	12 (7 to 22)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	326 (198 to 474)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Brooklyn Bay trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.00$ , p = 0.78), total nitrogen (TN No Trend,  $R^2 = 0.11$ , p = 0.15), chlorophyll (CHL No Trend,  $R^2 = 0.05$ , p = 0.32) and Secchi depth (Secchi No Trend,  $R^2 = 0.16$ , p = 0.09).



#### Florida LAKEWATCH Report for Crystal in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	8 - 20	13 (18)
Total Nitrogen (µg/L)	260 - 680	387 (18)
Chlorophyll- uncorrected (µg/L)	2 - 15	6 (18)
Secchi (ft)	4.5 - 12.3	7.3 (18)
Secchi (m)	1.4 - 3.7	2.2 (18)
Color (Pt-Co Units)	6 - 14	9 (4)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Crystal
GNIS Number	281128
Latitude	29.8216
Longitude	-82.0434
Water Body Type	Lake
Surface Area (ha and acre)	206 ha or 508 acre
Period of Record (year)	1988 to 2007
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	13 (8 to 20)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	387 (260 to 680)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Crystal trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.00$ , p = 0.81), total nitrogen (TN No Trend,  $R^2 = 0.00$ , p = 0.92), chlorophyll (CHL No Trend,  $R^2 = 0.04$ , p = 0.44) and Secchi depth (Secchi No Trend,  $R^2 = 0.20$ , p = 0.06).



#### Florida LAKEWATCH Report for Deer in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	4 - 15	7 (29)
Total Nitrogen (µg/L)	56 - 247	124 (28)
Chlorophyll- uncorrected (µg/L)	2 - 11	4 (29)
Secchi (ft)	12.5 - 29.8	21.9 (28)
Secchi (m)	3.8 - 9.1	6.7 (28)
Color (Pt-Co Units)	1 - 5	2 (21)
Specific Conductance (µS/cm@25 C)	20 - 27	23 (16)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Deer
GNIS Number	307205
Latitude	29.8450
Longitude	-81.9490
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	7 (4 to 15)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	124 (56 to 247)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Deer trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.08$ , p = 0.15), total nitrogen (TN No Trend,  $R^2 = 0.04$ , p = 0.29), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.71) and Secchi depth (Secchi No Trend,  $R^2 = 0.00$ , p = 0.98).



#### Florida LAKEWATCH Report for Doctors in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	20 µg/L	30 µg/L	1050 µg/L	90 µg/L	1910 µg/L
or					
>100 µS/cm@25 C					
<b>Clear Hard Water Lakes</b>					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	49 - 130	74 (20)
Total Nitrogen (µg/L)	805 - 1287	1056 (20)
Chlorophyll- uncorrected (µg/L)	14 - 45	28 (20)
Secchi (ft)	1.5 - 3.3	2.3 (20)
Secchi (m)	0.5 - 1.0	0.7 (20)
Color (Pt-Co Units)	29 - 113	62 (13)
Specific Conductance (µS/cm@25 C)	1406 - 10189	3389 (8)
Lake Classification	Colored	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay	
Name	Doctors	
GNIS Number	281632	
Latitude	30.1128	
Longitude	-81.7558	
Water Body Type	Lake	
Surface Area (ha and acre)	1375 ha or 3397 acre	
Period of Record (year)	1996 to 2016	
Lake Trophic Status (CHL)	Eutrophic	
TP Zone	TP4	
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	74 (49 to 130)	
TN Zone	TN4	
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1056 (805 to 1287)	



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Doctors trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.04$ , p = 0.43), total nitrogen (TN No Trend,  $R^2 = 0.00$ , p = 0.87), chlorophyll (CHL No Trend,  $R^2 = 0.05$ , p = 0.36) and Secchi depth (Secchi No Trend,  $R^2 = 0.16$ , p = 0.08).



#### Florida LAKEWATCH Report for Gator Bone in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).
| 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 <sup>1</sup>  | 2230 µg/L  |
| Colored Lakes                     |              |                        |            |                        |            |
| $\leq$ 40 Platinum Cobalt Units   |              |                        |            |                        |            |
| and $> 20 \text{ mg/L CaCO}_3$    | 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            |              |                        |            |                        |            |
| $\leq$ 40 Platinum Cobalt Units   |              |                        |            |                        |            |
| and $\leq 20 \text{ mg/L CaCO}_3$ | 6 µg/L       | 10 µg/L                | 510        | 30 µg/L                | 930 μg/L   |
| or                                |              |                        | μg/L       |                        |            |
| < 100 µS/cm@25 C                  |              |                        |            |                        |            |
| Clear Soft Water Lakes            |              |                        |            |                        |            |

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	2 - 9	5 (3)
Total Nitrogen (µg/L)	203 - 497	299 (3)
Chlorophyll- uncorrected (µg/L)	1 - 2	1 (3)
Secchi (ft)	6.7 - 7.9	7.3 (3)
Secchi (m)	2.0 - 2.4	2.2 (3)
Color (Pt-Co Units)	-	(0)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Gator Bone
GNIS Number	307204
Latitude	29.8115
Longitude	-81.9568
Water Body Type	Lake
Surface Area (ha and acre)	113 ha or 280 acre
Period of Record (year)	1988 to 1990
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	5 (2 to 9)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	299 (203 to 497)



- 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<sup>nd</sup> 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.

### 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 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.

- 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

### Florida LAKEWATCH Report for Geneva in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	Department of	of Environm	ental Protect	tion's Num	eric Nutrie	nt Criteria	for lakes.
I able I.	I IVI Iuu	Depui unent		intur r rottett	Ion Situm		In Criteria	IUI lanco.

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	$160 \mu g/L^{1}$	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	20 µg/L	30 µg/L	1050 µg/L	90 µg/L	1910 µg/L
or					
>100 µS/cm@25 C					
<b>Clear Hard Water Lakes</b>					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	4 - 10	6 (12)
Total Nitrogen (µg/L)	169 - 293	206 (12)
Chlorophyll- uncorrected (µg/L)	1 - 2	1 (12)
Secchi (ft)	4.5 - 15.2	8.9 (9)
Secchi (m)	1.4 - 4.6	2.7 (9)
Color (Pt-Co Units)	3 - 4	4 (3)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Geneva
GNIS Number	283018
Latitude	29.7733
Longitude	-82.0284
Water Body Type	Lake
Surface Area (ha and acre)	660 ha or 1630 acre
Period of Record (year)	1988 to 2005
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	6 (4 to 10)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	206 (169 to 293)



- 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<sup>nd</sup> 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.

### 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 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.

- 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. Lake Geneva trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.13$ , p = 0.25), total nitrogen (TN No Trend,  $R^2 = 0.30$ , p = 0.07), chlorophyll (CHL No Trend,  $R^2 = 0.12$ , p = 0.28) and Secchi depth (Secchi No Trend,  $R^2 = 0.35$ , p = 0.09).



### Florida LAKEWATCH Report for Hall in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	8 - 18	12 (12)
Total Nitrogen (µg/L)	136 - 513	334 (12)
Chlorophyll- uncorrected (µg/L)	2 - 16	5 (12)
Secchi (ft)	2.6 - 7.8	4.3 (12)
Secchi (m)	0.8 - 2.4	1.3 (12)
Color (Pt-Co Units)	2 - 11	4 (10)
Specific Conductance (µS/cm@25 C)	54 - 75	68 (4)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Hall
GNIS Number	283624
Latitude	29.7999
Longitude	-81.9207
Water Body Type	Lake
Surface Area (ha and acre)	174 ha or 430 acre
Period of Record (year)	1999 to 2010
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	12 (8 to 18)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	334 (136 to 513)



- 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<sup>nd</sup> 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.

### 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 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.

- 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. Lake Hall trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.03$ , p = 0.62), total nitrogen (TN No Trend,  $R^2 = 0.21$ , p = 0.13), chlorophyll (CHL No Trend,  $R^2 = 0.02$ , p = 0.68) and Secchi depth (Secchi No Trend,  $R^2 = 0.01$ , p = 0.79).



### Florida LAKEWATCH Report for Hillcrest in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Long Term Geometric	Annual	Minimum calculated		Maximum calculated	
Mean Lake Color and Long-	Geometric	numeric int	erpretation	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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	24 - 24	24 (1)
Total Nitrogen (µg/L)	837 - 837	837 (1)
Chlorophyll- uncorrected (µg/L)	13 - 13	13 (1)
Secchi (ft)	4.5 - 4.5	4.5 (1)
Secchi (m)	1.4 - 1.4	1.4 (1)
Color (Pt-Co Units)	-	(0)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Hillcrest
GNIS Number	
Latitude	29.7522
Longitude	-81.9977
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1996 to 1996
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	24 (24 to 24)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	837 (837 to 837)



- 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<sup>nd</sup> 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.

### 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 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.

- 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

### Florida LAKEWATCH Report for Hutchinson in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	Department of	of Environm	ental Protect	tion's Num	eric Nutrie	nt Criteria	for lakes.
I able I.	I IVI Iuu	Depui unent		intur r rottett	Ion Situm		In Criteria	IUI lanco.

Long Term Geometric	Annual	Minimum calculated		Maximum calculated	
Mean Lake Color and Long-	Geometric	numeric int	erpretation	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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	7 - 10	9 (3)
Total Nitrogen (µg/L)	219 - 234	225 (3)
Chlorophyll- uncorrected (µg/L)	2 - 5	3 (3)
Secchi (ft)	8.9 - 10.4	9.8 (3)
Secchi (m)	2.7 - 3.2	3.0 (3)
Color (Pt-Co Units)	2 - 3	3 (3)
Specific Conductance (µS/cm@25 C)	61 - 61	61 (1)
Lake Classification	Clear Softwater	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Hutchinson
GNIS Number	284437
Latitude	29.7481
Longitude	-82.0156
Water Body Type	Lake
Surface Area (ha and acre)	52 ha or 129 acre
Period of Record (year)	2005 to 2007
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	9 (7 to 10)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	225 (219 to 234)



- 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<sup>nd</sup> 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.

### 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 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.

- 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

### Florida LAKEWATCH Report for Johnson in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	Department of	of Environme	ental Protecti	on's Num	eric Nutrier	nt Criteria	for lakes
I able I.	I IVI Iuu	Department		multi i i ottetti	on Situm	ci ic i tuti ici		IOI Iancoa

Long Term Geometric	Annual	Minimum calculated		Maximum	calculated
Mean Lake Color and Long-	Geometric	numeric int	erpretation	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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	6 - 16	10 (29)
Total Nitrogen (µg/L)	173 - 556	285 (29)
Chlorophyll- uncorrected (µg/L)	2 - 8	3 (29)
Secchi (ft)	2.1 - 9.4	5.1 (29)
Secchi (m)	0.6 - 2.9	1.5 (29)
Color (Pt-Co Units)	2 - 11	6 (21)
Specific Conductance (µS/cm@25 C)	21 - 37	28 (16)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Johnson
GNIS Number	307133
Latitude	29.8202
Longitude	-81.9383
Water Body Type	Lake
Surface Area (ha and acre)	194 ha or 480 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	10 (6 to 16)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	285 (173 to 556)



- 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<sup>nd</sup> 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.

### 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 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.

- 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. Lake Johnson trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.22$ , p = 0.01), total nitrogen (TN Increasing,  $R^2 = 0.16$ , p = 0.03), chlorophyll (CHL No Trend,  $R^2 = 0.00$ , p = 0.83) and Secchi depth (Secchi No Trend,  $R^2 = 0.03$ , p = 0.33).



### Florida LAKEWATCH Report for Kingsley in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	20 µg/L	30 µg/L	1050 µg/L	90 µg/L	1910 µg/L
or					
>100 µS/cm@25 C					
<b>Clear Hard Water Lakes</b>					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	3 - 13	6 (35)
Total Nitrogen (µg/L)	252 - 464	330 (35)
Chlorophyll- uncorrected (µg/L)	1 - 5	3 (35)
Secchi (ft)	10.6 - 29.3	18.0 (35)
Secchi (m)	3.2 - 8.9	5.5 (35)
Color (Pt-Co Units)	3 - 14	7 (22)
Specific Conductance (µS/cm@25 C)	79 - 96	83 (16)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Kingsley
GNIS Number	285131
Latitude	29.9719
Longitude	-81.9987
Water Body Type	Lake
Surface Area (ha and acre)	583 ha or 1400 acre
Period of Record (year)	1988 to 2022
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	6 (3 to 13)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	330 (252 to 464)



- 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<sup>nd</sup> 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.

### 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 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.

- 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. Lake Kingsley trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.40$ , p = 0.00), total nitrogen (TN Increasing,  $R^2 = 0.26$ , p = 0.00), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.58) and Secchi depth (Secchi Decreasing,  $R^2 = 0.28$ , p = 0.00).



### Florida LAKEWATCH Report for Lily in Clay County Using Data Downloaded 12/9/2022

### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	20 µg/L	30 µg/L	1050 µg/L	90 µg/L	1910 µg/L
or					
>100 µS/cm@25 C					
<b>Clear Hard Water Lakes</b>					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	5 - 21	9 (33)
Total Nitrogen (µg/L)	98 - 381	187 (33)
Chlorophyll- uncorrected (µg/L)	2 - 14	3 (33)
Secchi (ft)	5.9 - 14.6	10.3 (33)
Secchi (m)	1.8 - 4.5	3.2 (33)
Color (Pt-Co Units)	1 - 10	3 (22)
Specific Conductance (µS/cm@25 C)	51 - 94	73 (16)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Lily
GNIS Number	285525
Latitude	29.7344
Longitude	-82.0259
Water Body Type	Lake
Surface Area (ha and acre)	46 ha or 113 acre
Period of Record (year)	1990 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	9 (5 to 21)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	187 (98 to 381)



- 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<sup>nd</sup> 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.

### 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 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.

- 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. Lake Lily trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.06$ , p = 0.17), total nitrogen (TN No Trend,  $R^2 = 0.08$ , p = 0.12), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.68) and Secchi depth (Secchi No Trend,  $R^2 = 0.06$ , p = 0.16).


#### Florida LAKEWATCH Report for Little Crystal in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	8 - 22	14 (18)
Total Nitrogen (µg/L)	317 - 782	495 (18)
Chlorophyll- uncorrected (µg/L)	4 - 31	11 (18)
Secchi (ft)	2.2 - 8.7	4.7 (18)
Secchi (m)	0.7 - 2.6	1.4 (18)
Color (Pt-Co Units)	19 - 23	21 (3)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Little Crystal
GNIS Number	
Latitude	29.8299
Longitude	-82.0472
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1987 to 2007
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (8 to 22)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	495 (317 to 782)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Little Crystal trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.34$ , p = 0.01), total nitrogen (TN No Trend,  $R^2 = 0.09$ , p = 0.22), chlorophyll (CHL No Trend,  $R^2 = 0.11$ , p = 0.19) and Secchi depth (Secchi No Trend,  $R^2 = 0.15$ , p = 0.12).



#### Florida LAKEWATCH Report for Little Johnson in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	6 - 40	13 (30)
Total Nitrogen (µg/L)	109 - 885	344 (30)
Chlorophyll- uncorrected (µg/L)	2 - 26	6 (30)
Secchi (ft)	0.9 - 9.0	4.0 (28)
Secchi (m)	0.3 - 2.7	1.2 (28)
Color (Pt-Co Units)	8 - 45	16 (21)
Specific Conductance (µS/cm@25 C)	19 - 33	24 (16)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Little Johnson
GNIS Number	307198
Latitude	29.8251
Longitude	-81.9479
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	13 (6 to 40)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	344 (109 to 885)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Little Johnson trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.40$ , p = 0.00), total nitrogen (TN Increasing,  $R^2 = 0.64$ , p = 0.00), chlorophyll (CHL Increasing,  $R^2 = 0.31$ , p = 0.00) and Secchi depth (Secchi No Trend,  $R^2 = 0.00$ , p = 0.74).



#### Florida LAKEWATCH Report for Little Keystone in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	20 µg/L	30 µg/L	1050 µg/L	90 µg/L	1910 µg/L
or					
>100 µS/cm@25 C					
<b>Clear Hard Water Lakes</b>					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	9 - 31	16 (9)
Total Nitrogen (µg/L)	342 - 668	450 (9)
Chlorophyll- uncorrected (µg/L)	2 - 18	6 (9)
Secchi (ft)	3.7 - 9.6	6.0 (9)
Secchi (m)	1.1 - 2.9	1.8 (9)
Color (Pt-Co Units)	9 - 11	10 (2)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Little Keystone
GNIS Number	285090
Latitude	29.7823
Longitude	-82.0343
Water Body Type	Lake
Surface Area (ha and acre)	8 ha or 20 acre
Period of Record (year)	1988 to 2002
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	16 (9 to 31)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	450 (342 to 668)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Little Keystone trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.51$ , p = 0.03), total nitrogen (TN Increasing,  $R^2 = 0.62$ , p = 0.01), chlorophyll (CHL Increasing,  $R^2 = 0.58$ , p = 0.02) and Secchi depth (Secchi No Trend,  $R^2 = 0.09$ , p = 0.43).



#### Florida LAKEWATCH Report for Margie in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	25 - 41	32 (2)
Total Nitrogen (µg/L)	1586 - 1715	1649 (2)
Chlorophyll- uncorrected (µg/L)	5 - 31	13 (2)
Secchi (ft)	2.9 - 3.6	3.2 (2)
Secchi (m)	0.9 - 1.1	1.0 (2)
Color (Pt-Co Units)	8 - 10	9 (2)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Margie
GNIS Number	307201
Latitude	29.7850
Longitude	-81.9828
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2001 to 2002
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	32 (25 to 41)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1649 (1586 to 1715)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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

#### Florida LAKEWATCH Report for Opal in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	Department of	of Environme	ental Protecti	on's Num	eric Nutrier	nt Criteria	for lakes
I able I.	I IVI Iuu	Department		multi i i ottetti	on Situm	ci ic i tuti ici		IOI Iancoa

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	5 - 10	7 (6)
Total Nitrogen (µg/L)	270 - 484	372 (6)
Chlorophyll- uncorrected (µg/L)	2 - 4	3 (6)
Secchi (ft)	13.6 - 18.8	15.4 (6)
Secchi (m)	4.1 - 5.7	4.7 (6)
Color (Pt-Co Units)	5 - 5	5 (1)
Specific Conductance (µS/cm@25 C)	49 - 49	49 (1)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Opal
GNIS Number	288163
Latitude	29.7421
Longitude	-82.0298
Water Body Type	Lake
Surface Area (ha and acre)	8 ha or 20 acre
Period of Record (year)	1992 to 2017
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	7 (5 to 10)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	372 (270 to 484)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Opal trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.78$ , p = 0.02), total nitrogen (TN No Trend,  $R^2 = 0.26$ , p = 0.30), chlorophyll (CHL Increasing,  $R^2 = 0.93$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.92$ , p = 0.00).



#### Florida LAKEWATCH Report for Payne's in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	10 - 12	11 (4)
Total Nitrogen (µg/L)	313 - 368	339 (4)
Chlorophyll- uncorrected (µg/L)	3 - 5	4 (4)
Secchi (ft)	4.2 - 8.5	5.3 (4)
Secchi (m)	1.3 - 2.6	1.6 (4)
Color (Pt-Co Units)	9 - 10	10 (3)
Specific Conductance (µS/cm@25 C)	98 - 98	98 (1)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Payne's
GNIS Number	
Latitude	29.7669
Longitude	-82.0459
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2000 to 2009
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	11 (10 to 12)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	339 (313 to 368)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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

#### Florida LAKEWATCH Report for Pebble in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	Department of	of Environn	nental Prote	ction's Nun	neric Nutrie	ent Criteria	for lakes.
I able I.	I IVI Iuu	Department		nental i l'ote	cuon situn			IUI lanco.

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	6 - 99	18 (16)
Total Nitrogen (µg/L)	45 - 1953	336 (16)
Chlorophyll- uncorrected (µg/L)	2 - 102	8 (16)
Secchi (ft)	1.5 - 11.4	4.7 (15)
Secchi (m)	0.5 - 3.5	1.4 (15)
Color (Pt-Co Units)	19 - 59	32 (7)
Specific Conductance (µS/cm@25 C)	19 - 41	28 (5)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Pebble
GNIS Number	307197
Latitude	29.8250
Longitude	-81.9534
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2011
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	18 (6 to 99)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	336 (45 to 1953)



- 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<sup>nd</sup> 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.

#### 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 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.

- 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. Lake Pebble trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.54$ , p = 0.00), total nitrogen (TN Increasing,  $R^2 = 0.68$ , p = 0.00), chlorophyll (CHL Increasing,  $R^2 = 0.34$ , p = 0.02) and Secchi depth (Secchi Decreasing,  $R^2 = 0.38$ , p = 0.01).



#### Florida LAKEWATCH Report for Ryan in Clay County Using Data Downloaded 12/9/2022

#### **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

#### 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	9 - 22	13 (3)
Total Nitrogen (µg/L)	266 - 467	382 (3)
Chlorophyll- uncorrected (µg/L)	3 - 8	5 (3)
Secchi (ft)	5.2 - 7.0	5.9 (3)
Secchi (m)	1.6 - 2.1	1.8 (3)
Color (Pt-Co Units)	-	(0)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Ryan
GNIS Number	
Latitude	30.0583
Longitude	-81.8296
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1993 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	13 (9 to 22)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	382 (266 to 467)


- 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<sup>nd</sup> 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.

## 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 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.

- 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.

### Florida LAKEWATCH Report for Sheelar in Clay County Using Data Downloaded 12/9/2022

# **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

## 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	<b>Department</b>	of Environn	nental Prote	ction's Nun	neric Nutrie	ent Criteria	for lakes.
I able I.	I IVI Iuu	Department		nental i l'ote	cuon situn			IUI lanco.

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	$160 \mu g/L^{1}$	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	20 µg/L	30 µg/L	1050 µg/L	90 µg/L	1910 µg/L
or					
>100 µS/cm@25 C					
<b>Clear Hard Water Lakes</b>					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	3 - 8	5 (30)
Total Nitrogen (µg/L)	43 - 233	132 (30)
Chlorophyll- uncorrected (µg/L)	1 - 5	2 (30)
Secchi (ft)	12.7 - 29.3	19.3 (30)
Secchi (m)	3.9 - 8.9	5.9 (30)
Color (Pt-Co Units)	1 - 7	4 (20)
Specific Conductance (µS/cm@25 C)	17 - 23	20 (16)
Lake Classification	<b>Clear Softwater</b>	

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in bold can be used for Nutrient Zone comparisons.

County	Clay
Name	Sheelar
GNIS Number	290952
Latitude	29.8393
Longitude	-81.9589
Water Body Type	Lake
Surface Area (ha and acre)	7 ha or 18 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	5 (3 to 8)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	132 (43 to 233)



- 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<sup>nd</sup> 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.

## 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 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.

- 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. Lake Sheelar trend plots of year by average. 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). Total phosphorus (TP Increasing,  $R^2 = 0.56$ , p = 0.00), total nitrogen (TN Increasing,  $R^2 = 0.48$ , p = 0.00), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.60) and Secchi depth (Secchi Decreasing,  $R^2 = 0.23$ , p = 0.01).



### Florida LAKEWATCH Report for Smith in Clay County Using Data Downloaded 12/9/2022

# **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

## 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	15 - 15	15 (1)
Total Nitrogen (µg/L)	411 - 411	411 (1)
Chlorophyll- uncorrected (µg/L)	4 - 4	4 (1)
Secchi (ft)	2.1 - 2.1	2.1 (1)
Secchi (m)	0.6 - 0.6	0.6 (1)
Color (Pt-Co Units)	3 - 3	3 (1)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Smith
GNIS Number	
Latitude	29.8025
Longitude	-81.9393
Water Body Type	Lake
Surface Area (ha and acre)	358 ha or 895 acre
Period of Record (year)	2001 to 2001
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	15 (15 to 15)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	411 (411 to 411)



- 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<sup>nd</sup> 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.

## 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 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.

- 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

## Florida LAKEWATCH Report for Spring in Clay County Using Data Downloaded 12/9/2022

# **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

## 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	Department of	of Environm	ental Protecti	on's Nume	eric Nutrient	t Criteria	for lakes.
I able I.	I IVI Iuu	Department		intar i rottetti	on situm			IOI Iancoa

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	11 - 19	14 (7)
Total Nitrogen (µg/L)	205 - 271	238 (7)
Chlorophyll- uncorrected (µg/L)	3 - 6	5 (7)
Secchi (ft)	4.0 - 7.3	5.7 (7)
Secchi (m)	1.2 - 2.2	1.7 (7)
Color (Pt-Co Units)	-	(0)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Spring
GNIS Number	291554
Latitude	29.8191
Longitude	-81.9868
Water Body Type	Lake
Surface Area (ha and acre)	59 ha or 146 acre
Period of Record (year)	1991 to 1997
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (11 to 19)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	238 (205 to 271)



- 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<sup>nd</sup> 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.

## 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 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.

- 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. Lake Spring trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.50$ , p = 0.08), total nitrogen (TN No Trend,  $R^2 = 0.01$ , p = 0.84), chlorophyll (CHL No Trend,  $R^2 = 0.18$ , p = 0.34) and Secchi depth (Secchi No Trend,  $R^2 = 0.54$ , p = 0.06).



#### Florida LAKEWATCH Report for Twin in Clay County Using Data Downloaded 12/9/2022

# **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

## 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	8 - 20	13 (13)
Total Nitrogen (µg/L)	243 - 637	348 (13)
Chlorophyll- uncorrected (µg/L)	2 - 8	4 (13)
Secchi (ft)	4.9 - 13.0	8.1 (13)
Secchi (m)	1.5 - 4.0	2.5 (13)
Color (Pt-Co Units)	5 - 11	7 (6)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	Twin
GNIS Number	
Latitude	29.7679
Longitude	-81.9964
Water Body Type	Lake
Surface Area (ha and acre)	11 ha or 28 acre
Period of Record (year)	1996 to 2008
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	13 (8 to 20)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	348 (243 to 637)



- 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<sup>nd</sup> 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.

## 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 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.

- 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. Lake Twin trend plots of year by average. 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). Total phosphorus (TP No Trend,  $R^2 = 0.27$ , p = 0.07), total nitrogen (TN Increasing,  $R^2 = 0.57$ , p = 0.00), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.70) and Secchi depth (Secchi No Trend,  $R^2 = 0.02$ , p = 0.63).



## Florida LAKEWATCH Report for West Smith in Clay County Using Data Downloaded 12/9/2022

## **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

## 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	28 - 28	28 (1)
Total Nitrogen (µg/L)	587 - 587	587 (1)
Chlorophyll- uncorrected (µg/L)	14 - 14	14 (1)
Secchi (ft)	1.9 - 1.9	1.9 (1)
Secchi (m)	0.6 - 0.6	0.6 (1)
Color (Pt-Co Units)	2 - 2	2 (1)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 ( $\mu g/L$ : min and max): Grand Geometric Means of all annual geometric means ( $\mu g/L$ ) 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	West Smith
GNIS Number	291256
Latitude	29.7977
Longitude	-81.9526
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2001 to 2001
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	28 (28 to 28)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	587 (587 to 587)



- 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<sup>nd</sup> 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.

## 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 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.

- 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.

## Florida LAKEWATCH Report for White Sand in Clay County Using Data Downloaded 12/9/2022

# **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 <u>five or more</u> years of data. Step by step instructions on how to use the data tables are provided on page 4 of this report.

## 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.

- 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 ( $\mu$ S/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 CaCO<sub>3</sub> 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 CaCO<sub>3</sub> or specific conductance greater 100 µS/cm @ 25 C).

Table 1.	Florida	Department of	of Environn	nental Prote	ction's Nun	neric Nutrie	ent Criteria	for lakes.
I able I.	I IVI Iuu	Department		nental i l'ote	cuon situn			IUI lanco.

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 <sup>1</sup>	2230 µg/L
Colored Lakes					
$\leq$ 40 Platinum Cobalt Units					
and $> 20 \text{ mg/L CaCO}_3$	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					
$\leq$ 40 Platinum Cobalt Units					
and $\leq 20 \text{ mg/L CaCO}_3$	6 µg/L	10 µg/L	510	30 µg/L	930 μg/L
or			μg/L		
< 100 µS/cm@25 C					
Clear Soft Water Lakes					

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  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

Parameter	Minimum and Maximum Annual Geometric Means	Grand Geometric Mean (Sampling years)
Total Phosphorus (µg/L)	9 - 9	9 (2)
Total Nitrogen (µg/L)	206 - 277	239 (2)
Chlorophyll- uncorrected (µg/L)	2 - 3	2 (2)
Secchi (ft)	5.4 - 8.8	6.9 (2)
Secchi (m)	1.7 - 2.7	2.1 (2)
Color (Pt-Co Units)	-	(0)
Specific Conductance (µS/cm@25 C)	-	(0)
Lake Classification		

The long-term data summary will include the following parameters listed with a definition after each one:

- County: Name of county in which the lake resides.
- Name: Lake name that LAKEWATCH uses for the system.
- GNIS Number: Number created by USGS's Geographic Names Information System.
- 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 90<sup>th</sup> percentile concentrations in Figure 1. Values in **bold** can be used for Nutrient Zone comparisons.

County	Clay
Name	White Sand
GNIS Number	307138
Latitude	29.8145
Longitude	-81.9708
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 1992
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP2
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	9 (9 to 9)
TN Zone	TN2
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	239 (206 to 277)



- 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<sup>nd</sup> 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.

## 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 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.

- 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.