#### Florida LAKEWATCH Report for Agnes in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	20 - 40	28 (7)
Total Nitrogen (µg/L)	327 - 547	443 (7)
Chlorophyll- uncorrected (µg/L)	4 - 15	9 (7)
Secchi (ft)	4.8 - 8.3	6.1 (7)
Secchi (m)	1.5 - 2.5	1.9 (7)
Color (Pt-Co Units)	7 - 31	12 (5)
Specific Conductance (µS/cm@25 C)	173 - 186	179 (2)
Lake Classification	Clear Hardwater	

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	Polk
Name	Agnes
GNIS Number	277698
Latitude	28.1618
Longitude	-81.8185
Water Body Type	Lake
Surface Area (ha and acre)	156 ha or 386 acre
Period of Record (year)	2000 to 2009
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	28 (20 to 40)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	443 (327 to 547)



- 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 Agnes 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,  $R^2 = 0.01$ , p = 0.85), total nitrogen (TN No Trend,  $R^2 = 0.07$ , p = 0.56), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.81) and Secchi depth (Secchi No Trend,  $R^2 = 0.01$ , p = 0.85).



#### Florida LAKEWATCH Report for Annie in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	23 - 23	23 (1)
Total Nitrogen (µg/L)	1310 - 1310	1310 (1)
Chlorophyll- uncorrected (µg/L)	18 - 18	18 (1)
Secchi (ft)	3.8 - 3.8	3.8 (1)
Secchi (m)	1.2 - 1.2	1.2 (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	Polk
Name	Annie
GNIS Number	277897
Latitude	27.9865
Longitude	-81.6065
Water Body Type	Lake
Surface Area (ha and acre)	180 ha or 445 acre
Period of Record (year)	1990 to 1990
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	23 (23 to 23)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1310 (1310 to 1310)



- 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.
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- 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.
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- 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.
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  - 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 Arbuckle in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	36 - 133	64 (7)
Total Nitrogen (µg/L)	958 - 1320	1117 (7)
Chlorophyll- uncorrected ( $\mu$ g/L)	5 - 22	13 (7)
Secchi (ft)	1.2 - 2.9	1.7 (7)
Secchi (m)	0.4 - 0.9	0.5 (7)
Color (Pt-Co Units)	148 - 269	207 (4)
Specific Conductance (µS/cm@25 C)	-	(0)
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	Polk
Name	Arbuckle
GNIS Number	277931
Latitude	27.6934
Longitude	-81.3972
Water Body Type	Lake
Surface Area (ha and acre)	1549 ha or 3828 acre
Period of Record (year)	1993 to 2006
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	64 (36 to 133)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1117 (958 to 1320)



- 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 Arbuckle 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,  $R^2 = 0.25$ , p = 0.26), total nitrogen (TN No Trend,  $R^2 = 0.13$ , p = 0.43), chlorophyll (CHL No Trend,  $R^2 = 0.22$ , p = 0.29) and Secchi depth (Secchi Decreasing,  $R^2 = 0.81$ , p = 0.01).



#### Florida LAKEWATCH Report for Ariana in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	19 - 45	26 (3)	
Total Nitrogen (µg/L)	667 - 1223	838 (3)	
Chlorophyll- uncorrected (µg/L)	10 - 69	23 (3)	
Secchi (ft)	2.3 - 6.8	4.7 (3)	
Secchi (m)	0.7 - 2.1	1.4 (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	Polk
Name	Ariana
GNIS Number	277946
Latitude	28.0722
Longitude	-81.7975
Water Body Type	Lake
Surface Area (ha and acre)	415 ha or 1026 acre
Period of Record (year)	1999 to 2001
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	26 (19 to 45)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	838 (667 to 1223)



- 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 Arietta in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	12 - 27	19 (19)	
Total Nitrogen (µg/L)	328 - 694	478 (19)	
Chlorophyll- uncorrected (µg/L)	4 - 16	8 (19)	
Secchi (ft)	5.4 - 11.1	7.9 (19)	
Secchi (m)	1.6 - 3.4	2.4 (19)	
Color (Pt-Co Units)	5 - 19	9 (14)	
Specific Conductance (µS/cm@25 C)	213 - 305	257 (14)	
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	Polk
Name	Arietta
GNIS Number	277947
Latitude	28.1067
Longitude	-81.8027
Water Body Type	Lake
Surface Area (ha and acre)	307 ha or 758 acre
Period of Record (year)	1997 to 2022
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	19 (12 to 27)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	478 (328 to 694)



- 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 Arietta 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 = 0.13), total nitrogen (TN Increasing,  $R^2 = 0.24$ , p = 0.03), chlorophyll (CHL No Trend,  $R^2 = 0.08$ , p = 0.24) and Secchi depth (Secchi No Trend,  $R^2 = 0.09$ , p = 0.20).



#### Florida LAKEWATCH Report for Aurora in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 8	8(1)
Total Nitrogen (µg/L)	944 - 944	944 (1)
Chlorophyll- uncorrected (µg/L)	2 - 2	2 (1)
Secchi (ft)	14.3 - 14.3	14.3 (1)
Secchi (m)	4.4 - 4.4	4.4 (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	Polk
Name	Aurora
GNIS Number	277999
Latitude	27.8763
Longitude	-81.4651
Water Body Type	Lake
Surface Area (ha and acre)	71 ha or 176 acre
Period of Record (year)	2000 to 2000
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	8 (8 to 8)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	944 (944 to 944)



- 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 Banana Pit South in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	71 - 136	106 (11)	
Total Nitrogen (µg/L)	1521 - 1979	1710 (11)	
Chlorophyll- uncorrected (µg/L)	14 - 82	45 (11)	
Secchi (ft)	1.6 - 2.7	2.1 (11)	
Secchi (m)	0.5 - 0.8	0.6 (11)	
Color (Pt-Co Units)	17 - 31	22 (11)	
Specific Conductance (µS/cm@25 C)	164 - 232	188 (10)	
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	Polk
Name	Banana Pit South
GNIS Number	304719
Latitude	27.9760
Longitude	-81.9124
Water Body Type	Lake
Surface Area (ha and acre)	ha or . acre
Period of Record (year)	2006 to 2016
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	106 (71 to 136)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1710 (1521 to 1979)



- 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 Banana Pit 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,  $R^2 = 0.02$ , p = 0.66), total nitrogen (TN Increasing,  $R^2 = 0.70$ , p = 0.00), chlorophyll (CHL No Trend,  $R^2 = 0.00$ , p = 0.99) and Secchi depth (Secchi Decreasing,  $R^2 = 0.91$ , p = 0.00).



#### Florida LAKEWATCH Report for Belle East in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	13 - 37	22 (9)
Total Nitrogen (µg/L)	525 - 1307	828 (9)
Chlorophyll- uncorrected (µg/L)	5 - 24	11 (9)
Secchi (ft)	4.7 - 10.4	7.5 (9)
Secchi (m)	1.4 - 3.2	2.3 (9)
Color (Pt-Co Units)	12 - 33	22 (4)
Specific Conductance (µS/cm@25 C)	357 - 357	357 (1)
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	Polk
Name	Belle East
GNIS Number	2787754
Latitude	27.8829
Longitude	-81.5830
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1996 to 2007
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	22 (13 to 37)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	828 (525 to 1307)



- 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 Belle East 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 = 0.15), total nitrogen (TN No Trend,  $R^2 = 0.00$ , p = 0.93), chlorophyll (CHL Increasing,  $R^2 = 0.47$ , p = 0.04) and Secchi depth (Secchi No Trend,  $R^2 = 0.02$ , p = 0.75).



#### Florida LAKEWATCH Report for Belle West in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	14 - 38	26 (4)	
Total Nitrogen (µg/L)	627 - 1073	848 (4)	
Chlorophyll- uncorrected (µg/L)	10 - 27	18 (4)	
Secchi (ft)	3.6 - 11.3	6.6 (4)	
Secchi (m)	1.1 - 3.5	2.0 (4)	
Color (Pt-Co Units)	12 - 32	20 (4)	
Specific Conductance (µS/cm@25 C)	359 - 359	359 (1)	
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	Polk
Name	Belle West
GNIS Number	278450
Latitude	27.8827
Longitude	-81.5894
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2004 to 2007
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	26 (14 to 38)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	848 (627 to 1073)



- 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 Bentley in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean (Sampling years)	
Total Phosphorus (ug/L)	223 - 265	243 (2)	
Total Nitrogen (µg/L)	1363 - 1414	1389 (2)	
Chlorophyll- uncorrected ( $\mu$ g/L)	60 - 70	65 (2)	
Secchi (ft)	2.0 - 2.2	2.1 (2)	
Secchi (m)	0.6 - 0.7	0.6 (2)	
Color (Pt-Co Units)	14 - 16	15 (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	Polk
Name	Bentley
GNIS Number	278493
Latitude	28.0131
Longitude	-81.9287
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2001 to 2002
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	243 (223 to 265)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1389 (1363 to 1414)



- 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 Bess in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	12 - 25	18 (5)	
Total Nitrogen (µg/L)	547 - 751	626 (5)	
Chlorophyll- uncorrected (µg/L)	3 - 13	7 (5)	
Secchi (ft)	5.5 - 10.3	7.0 (5)	
Secchi (m)	1.7 - 3.1	2.1 (5)	
Color (Pt-Co Units)	13 - 21	16 (5)	
Specific Conductance (µS/cm@25 C)	271 - 289	280 (2)	
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	Polk
Name	Bess
GNIS Number	278511
Latitude	27.9713
Longitude	-81.6504
Water Body Type	Lake
Surface Area (ha and acre)	60 ha or 148 acre
Period of Record (year)	2004 to 2008
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	18 (12 to 25)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	626 (547 to 751)



- 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 Bess 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,  $R^2 = 0.01$ , p = 0.91), total nitrogen (TN No Trend,  $R^2 = 0.18$ , p = 0.47), chlorophyll (CHL No Trend,  $R^2 = 0.02$ , p = 0.82) and Secchi depth (Secchi No Trend,  $R^2 = 0.24$ , p = 0.40).



### Florida LAKEWATCH Report for Big Bass in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	225 - 483	330 (32)	
Total Nitrogen (µg/L)	1730 - 3412	2323 (32)	
Chlorophyll- uncorrected (µg/L)	64 - 202	110 (32)	
Secchi (ft)	0.9 - 2.5	1.4 (32)	
Secchi (m)	0.3 - 0.8	0.4 (32)	
Color (Pt-Co Units)	20 - 31	25 (22)	
Specific Conductance (µS/cm@25 C)	149 - 216	178 (16)	
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	Polk
Name	Big Bass
GNIS Number	
Latitude	27.8759
Longitude	-81.8539
Water Body Type	Lake
Surface Area (ha and acre)	1 ha or 3 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	330 (225 to 483)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2323 (1730 to 3412)



- 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 Big Bass 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 = 0.93), total nitrogen (TN Increasing,  $R^2 = 0.18$ , p = 0.01), chlorophyll (CHL No Trend,  $R^2 = 0.07$ , p = 0.15) and Secchi depth (Secchi Decreasing,  $R^2 = 0.49$ , p = 0.00).



#### Florida LAKEWATCH Report for Blue 2 in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	61 - 127	80 (4)
Total Nitrogen (µg/L)	1206 - 2577	1634 (4)
Chlorophyll- uncorrected (µg/L)	28 - 89	46 (4)
Secchi (ft)	1.3 - 2.2	1.8 (4)
Secchi (m)	0.4 - 0.7	0.6 (4)
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	Polk
Name	Blue 2
GNIS Number	279079
Latitude	28.0497
Longitude	-81.7738
Water Body Type	Lake
Surface Area (ha and acre)	23 ha or 56 acre
Period of Record (year)	1991 to 1994
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	80 (61 to 127)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1634 (1206 to 2577)



- 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 Blue North in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 14	5 (19)
Total Nitrogen (µg/L)	1067 - 4968	2435 (19)
Chlorophyll- uncorrected (µg/L)	1 - 11	2 (19)
Secchi (ft)	5.0 - 27.6	17.3 (19)
Secchi (m)	1.5 - 8.4	5.3 (19)
Color (Pt-Co Units)	2 - 12	5 (9)
Specific Conductance (µS/cm@25 C)	172 - 217	196 (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 (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	Polk
Name	Blue North
GNIS Number	279035
Latitude	27.8566
Longitude	-81.5808
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2009
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	5 (2 to 14)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2435 (1067 to 4968)



- 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 Blue 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,  $R^2 = 0.45$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.63$ , p = 0.00), chlorophyll (CHL Increasing,  $R^2 = 0.26$ , p = 0.03) and Secchi depth (Secchi Decreasing,  $R^2 = 0.50$ , p = 0.00).



#### Florida LAKEWATCH Report for Blue South in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	1 - 5	4 (4)
Total Nitrogen (µg/L)	1500 - 2240	1693 (4)
Chlorophyll- uncorrected (µg/L)	2 - 3	2 (4)
Secchi (ft)	15.3 - 20.0	17.5 (4)
Secchi (m)	4.7 - 6.1	5.3 (4)
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	Polk
Name	Blue South
GNIS Number	279035
Latitude	27.8493
Longitude	-81.5754
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 1994
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	4 (1 to 5)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1693 (1500 to 2240)



- 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 Boca Cove in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Grand Geometric	
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	199 - 439	302 (32)
Total Nitrogen (µg/L)	1676 - 3076	2232 (32)
Chlorophyll- uncorrected (µg/L)	60 - 159	102 (32)
Secchi (ft)	0.9 - 2.7	1.4 (32)
Secchi (m)	0.3 - 0.8	0.4 (32)
Color (Pt-Co Units)	18 - 34	23 (22)
Specific Conductance (µS/cm@25 C)	134 - 209	173 (16)
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	Polk
Name	Boca Cove
GNIS Number	
Latitude	27.8740
Longitude	-81.8528
Water Body Type	Lake
Surface Area (ha and acre)	2 ha or 5 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	302 (199 to 439)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2232 (1676 to 3076)



- 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 Boca Cove 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,  $R^2 = 0.01$ , p = 0.54), total nitrogen (TN Increasing,  $R^2 = 0.16$ , p = 0.02), chlorophyll (CHL No Trend,  $R^2 = 0.00$ , p = 0.77) and Secchi depth (Secchi Decreasing,  $R^2 = 0.49$ , p = 0.00).



## Florida LAKEWATCH Report for Bonnet in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	40 - 40	40 (1)
Total Nitrogen (µg/L)	1037 - 1037	1037 (1)
Chlorophyll- uncorrected (µg/L)	16 - 16	16 (1)
Secchi (ft)	3.5 - 3.5	3.5 (1)
Secchi (m)	1.1 - 1.1	1.1 (1)
Color (Pt-Co Units)	32 - 32	32 (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	Polk
Name	Bonnet
GNIS Number	279214
Latitude	28.1468
Longitude	-81.6621
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2006 to 2006
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	40 (40 to 40)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1037 (1037 to 1037)



- 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 Bonny in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	121 - 136	128 (2)	
Total Nitrogen (µg/L)	2123 - 2653	2373 (2)	
Chlorophyll- uncorrected (µg/L)	85 - 115	99 (2)	
Secchi (ft)	1.7 - 2.0	1.8 (2)	
Secchi (m)	0.5 - 0.6	0.6 (2)	
Color (Pt-Co Units)	29 - 48	37 (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	Polk
Name	Bonny
GNIS Number	279245
Latitude	28.0460
Longitude	-81.9316
Water Body Type	Lake
Surface Area (ha and acre)	108 ha or 267 acre
Period of Record (year)	2001 to 2002
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	128 (121 to 136)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2373 (2123 to 2653)



- 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 Buffum in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	18 - 52	37 (13)
Total Nitrogen (µg/L)	380 - 1118	736 (13)
Chlorophyll- uncorrected (µg/L)	9 - 42	21 (13)
Secchi (ft)	1.7 - 4.0	2.4 (13)
Secchi (m)	0.5 - 1.2	0.7 (13)
Color (Pt-Co Units)	17 - 45	30 (9)
Specific Conductance (µS/cm@25 C)	127 - 193	177 (6)
Lake Classification	Clear Hardwater	

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	Polk
Name	Buffum
GNIS Number	279626
Latitude	27.7892
Longitude	-81.6436
Water Body Type	Lake
Surface Area (ha and acre)	624 ha or 1543 acre
Period of Record (year)	1996 to 2014
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	37 (18 to 52)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	736 (380 to 1118)



- 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 Buffum 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,  $R^2 = 0.22$ , p = 0.11), total nitrogen (TN Increasing,  $R^2 = 0.52$ , p = 0.01), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.76) and Secchi depth (Secchi Decreasing,  $R^2 = 0.53$ , p = 0.00).



## Florida LAKEWATCH Report for Cannon in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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					
<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)	37 - 56	44 (4)
Total Nitrogen (µg/L)	821 - 1400	1037 (4)
Chlorophyll- uncorrected (µg/L)	29 - 58	39 (4)
Secchi (ft)	2.3 - 3.2	2.7 (4)
Secchi (m)	0.7 - 1.0	0.8 (4)
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	Polk
Name	Cannon
GNIS Number	279989
Latitude	28.0391
Longitude	-81.7491
Water Body Type	Lake
Surface Area (ha and acre)	136 ha or 336 acre
Period of Record (year)	1991 to 1999
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	44 (37 to 56)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1037 (821 to 1400)



- 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 Clark in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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	Grand Geometric Mean
Total Phosphorus (ug/L)	252 - 374	(Sampling years) 307 (2)
Total Nitrogen (µg/L)	1188 - 2016	1547 (2)
Chlorophyll- uncorrected ( $\mu g/L$ )	70 - 119	91 (2)
Secchi (ft)	1.5 - 2.5	2.0 (2)
Secchi (m)	0.5 - 0.8	0.6 (2)
Color (Pt-Co Units)	20 - 24	22 (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	Polk
Name	Clark
GNIS Number	304716
Latitude	27.9386
Longitude	-81.9664
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2005 to 2006
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	307 (252 to 374)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1547 (1188 to 2016)



- 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 Clearwater in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	16 - 18	17 (2)
Total Nitrogen (µg/L)	582 - 790	678 (2)
Chlorophyll- uncorrected (µg/L)	6 - 10	8 (2)
Secchi (ft)	5.9 - 7.6	6.7 (2)
Secchi (m)	1.8 - 2.3	2.0 (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	Polk
Name	Clearwater
GNIS Number	280549
Latitude	28.1703
Longitude	-81.8347
Water Body Type	Lake
Surface Area (ha and acre)	35 ha or 86 acre
Period of Record (year)	1996 to 1997
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	17 (16 to 18)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	678 (582 to 790)



- 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 Clinch in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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 Grand Geometric N	
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	12 - 28	15 (11)
Total Nitrogen (µg/L)	434 - 737	545 (11)
Chlorophyll- uncorrected (µg/L)	5 - 19	10 (11)
Secchi (ft)	4.5 - 9.1	7.1 (11)
Secchi (m)	1.4 - 2.8	2.2 (11)
Color (Pt-Co Units)	7 - 55	19 (6)
Specific Conductance (µS/cm@25 C)	87 - 150	117 (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	Polk
Name	Clinch
GNIS Number	294405
Latitude	27.7512
Longitude	-81.5437
Water Body Type	Lake
Surface Area (ha and acre)	488 ha or 1207 acre
Period of Record (year)	1996 to 2014
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	15 (12 to 28)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	545 (434 to 737)



- 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 Clinch 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,  $R^2 = 0.07$ , p = 0.44), total nitrogen (TN No Trend,  $R^2 = 0.15$ , p = 0.24), chlorophyll (CHL No Trend,  $R^2 = 0.04$ , p = 0.54) and Secchi depth (Secchi No Trend,  $R^2 = 0.01$ , p = 0.78).



## Florida LAKEWATCH Report for Conine in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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 Grand Geometric	
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	51 - 399	184 (3)
Total Nitrogen (µg/L)	1473 - 1764	1644 (3)
Chlorophyll- uncorrected (µg/L)	60 - 86	74 (3)
Secchi (ft)	1.9 - 2.4	2.1 (3)
Secchi (m)	0.6 - 0.7	0.6 (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	Polk
Name	Conine
GNIS Number	280711
Latitude	28.0637
Longitude	-81.7252
Water Body Type	Lake
Surface Area (ha and acre)	96 ha or 236 acre
Period of Record (year)	1991 to 1995
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	184 (51 to 399)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1644 (1473 to 1764)



- 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 Crago in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	129 - 199	154 (5)
Total Nitrogen (µg/L)	1161 - 2306	1598 (5)
Chlorophyll- uncorrected (µg/L)	54 - 145	90 (5)
Secchi (ft)	1.7 - 2.9	2.4 (5)
Secchi (m)	0.5 - 0.9	0.7 (5)
Color (Pt-Co Units)	29 - 40	34 (5)
Specific Conductance (µS/cm@25 C)	199 - 213	206 (2)
Lake Classification	Clear Hardwater	

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	Polk
Name	Crago
GNIS Number	280984
Latitude	28.0918
Longitude	-81.9473
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2002 to 2011
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	154 (129 to 199)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1598 (1161 to 2306)



- 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 Crago 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,  $R^2 = 0.02$ , p = 0.84), total nitrogen (TN Increasing,  $R^2 = 0.99$ , p = 0.00), chlorophyll (CHL Increasing,  $R^2 = 0.80$ , p = 0.04) and Secchi depth (Secchi No Trend,  $R^2 = 0.12$ , p = 0.56).



### Florida LAKEWATCH Report for Crescent in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	128 - 190	164 (4)
Total Nitrogen (µg/L)	1025 - 1084	1046 (4)
Chlorophyll- uncorrected (µg/L)	68 - 93	77 (4)
Secchi (ft)	2.6 - 2.9	2.7 (4)
Secchi (m)	0.8 - 0.9	0.8 (4)
Color (Pt-Co Units)	31 - 40	35 (4)
Specific Conductance (µS/cm@25 C)	148 - 177	163 (4)
Lake Classification	Clear Hardwater	

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	Polk
Name	Crescent
GNIS Number	304717
Latitude	27.9458
Longitude	-81.9552
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2014 to 2017
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	164 (128 to 190)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1046 (1025 to 1084)



- 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 Crooked in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	10 - 19	14 (28)
Total Nitrogen (µg/L)	405 - 757	590 (28)
Chlorophyll- uncorrected (µg/L)	4 - 13	7 (28)
Secchi (ft)	4.7 - 9.5	6.7 (28)
Secchi (m)	1.4 - 2.9	2.0 (28)
Color (Pt-Co Units)	12 - 46	23 (20)
Specific Conductance (µS/cm@25 C)	74 - 97	86 (13)
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	Polk
Name	Crooked
GNIS Number	293976
Latitude	27.8086
Longitude	-81.5541
Water Body Type	Lake
Surface Area (ha and acre)	2241 ha or 5538 acre
Period of Record (year)	1990 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (10 to 19)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	590 (405 to 757)



- 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 Crooked 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,  $R^2 = 0.02$ , p = 0.50), total nitrogen (TN No Trend,  $R^2 = 0.04$ , p = 0.29), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.63) and Secchi depth (Secchi No Trend,  $R^2 = 0.00$ , p = 0.97).



## Florida LAKEWATCH Report for Crooked-Babson Park in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	9 - 17	13 (23)	
Total Nitrogen (µg/L)	260 - 655	550 (23)	
Chlorophyll- uncorrected (µg/L)	4 - 14	7 (23)	
Secchi (ft)	4.0 - 10.7	7.1 (23)	
Secchi (m)	1.2 - 3.3	2.2 (23)	
Color (Pt-Co Units)	15 - 32	22 (3)	
Specific Conductance (µS/cm@25 C)	82 - 96	87 (3)	
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	Polk
Name	Crooked-Babson Park
GNIS Number	293976
Latitude	27.8224
Longitude	-81.5461
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2000 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	13 (9 to 17)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	550 (260 to 655)



- 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 Crooked-Babson Park 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,  $R^2 = 0.01$ , p = 0.62), total nitrogen (TN No Trend,  $R^2 = 0.06$ , p = 0.25), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.60) and Secchi depth (Secchi No Trend,  $R^2 = 0.01$ , p = 0.66).



## Florida LAKEWATCH Report for Crooked-Seminole Rd. drain in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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 - 18	13 (23)
Total Nitrogen (µg/L)	260 - 675	557 (23)
Chlorophyll- uncorrected (µg/L)	4 - 12	7 (23)
Secchi (ft)	4.9 - 10.8	7.3 (23)
Secchi (m)	1.5 - 3.3	2.2 (23)
Color (Pt-Co Units)	14 - 32	22 (3)
Specific Conductance (µS/cm@25 C)	77 - 95	85 (3)
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	Polk
Name	Crooked-Seminole Rd. drain
GNIS Number	293976
Latitude	27.8333
Longitude	-81.5434
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2000 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	13 (9 to 18)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	557 (260 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 Crooked-Seminole Rd. drain trend plots of year by average. The R<sup>2</sup> value indicates the strength of the relations (ranges from 0.0 to 1.0; higher the R<sup>2</sup> 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<sup>2</sup> = 0.02, p = 0.57), total nitrogen (TN No Trend, R<sup>2</sup> = 0.05, p = 0.30), chlorophyll (CHL No Trend, R<sup>2</sup> = 0.01, p = 0.61) and Secchi depth (Secchi No Trend, R<sup>2</sup> = 0.02, p = 0.54).



### Florida LAKEWATCH Report for Cypress in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 11	9 (10)
Total Nitrogen (µg/L)	584 - 846	728 (10)
Chlorophyll- uncorrected (µg/L)	3 - 6	5 (10)
Secchi (ft)	6.6 - 14.7	9.4 (10)
Secchi (m)	2.0 - 4.5	2.9 (10)
Color (Pt-Co Units)	6 - 11	8 (10)
Specific Conductance (µS/cm@25 C)	124 - 216	173 (9)
Lake Classification	Clear Hardwater	

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	Polk
Name	Cypress
GNIS Number	281218
Latitude	27.9140
Longitude	-81.4769
Water Body Type	Lake
Surface Area (ha and acre)	28.97 ha or 71 acre
Period of Record (year)	2006 to 2015
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	9 (6 to 11)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	728 (584 to 846)



- 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 Cypress 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 = 0.49), total nitrogen (TN No Trend,  $R^2 = 0.20$ , p = 0.20), chlorophyll (CHL No Trend,  $R^2 = 0.00$ , p = 0.98) and Secchi depth (Secchi No Trend,  $R^2 = 0.06$ , p = 0.49).



#### Florida LAKEWATCH Report for Daisy in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	17 - 27	21 (18)	
Total Nitrogen (µg/L)	378 - 548	465 (18)	
Chlorophyll- uncorrected (µg/L)	3 - 11	6 (18)	
Secchi (ft)	5.6 - 8.8	6.8 (18)	
Secchi (m)	1.7 - 2.7	2.1 (18)	
Color (Pt-Co Units)	11 - 21	14 (17)	
Specific Conductance (µS/cm@25 C)	151 - 214	189 (15)	
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 (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	Polk
Name	Daisy
GNIS Number	281260
Latitude	27.9983
Longitude	-81.6613
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2005 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	21 (17 to 27)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	465 (378 to 548)



- 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 Daisy 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 Decreasing,  $R^2 = 0.51$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.52$ , p = 0.00), chlorophyll (CHL Decreasing,  $R^2 = 0.85$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.48$ , p = 0.00).



## Florida LAKEWATCH Report for Davenport North in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	14 - 24	21 (7)	
Total Nitrogen (µg/L)	503 - 723	592 (7)	
Chlorophyll- uncorrected (µg/L)	5 - 12	7 (7)	
Secchi (ft)	2.6 - 4.4	3.1 (7)	
Secchi (m)	0.8 - 1.4	0.9 (7)	
Color (Pt-Co Units)	34 - 104	55 (5)	
Specific Conductance (µS/cm@25 C)	82 - 102	90 (4)	
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	Polk	
Name	Davenport North	
GNIS Number	281310	
Latitude	28.3389	
Longitude	-81.6580	
Water Body Type	Lake	
Surface Area (ha and acre)	26 ha or 65 acre	
Period of Record (year)	2006 to 2021	
Lake Trophic Status (CHL)	Eutrophic	
TP Zone	TP3	
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	21 (14 to 24)	
TN Zone	TN4	
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	592 (503 to 723)	


- 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 Davenport 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 No Trend,  $R^2 = 0.02$ , p = 0.77), total nitrogen (TN No Trend,  $R^2 = 0.01$ , p = 0.86), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.84) and Secchi depth (Secchi No Trend,  $R^2 = 0.01$ , p = 0.85).



### Florida LAKEWATCH Report for Deer in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	44 - 54	49 (2)
Total Nitrogen (µg/L)	1888 - 1900	1894 (2)
Chlorophyll- uncorrected (µg/L)	68 - 68	68 (1)
Secchi (ft)	1.7 - 1.7	1.7 (1)
Secchi (m)	0.5 - 0.5	0.5 (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	Polk
Name	Deer
GNIS Number	281459
Latitude	28.0263
Longitude	-81.7603
Water Body Type	Lake
Surface Area (ha and acre)	51 ha or 125 acre
Period of Record (year)	1991 to 1992
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	49 (44 to 54)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1894 (1888 to 1900)



- 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 Dexter in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 13	10 (19)	
Total Nitrogen (µg/L)	382 - 500	438 (19)	
Chlorophyll- uncorrected (µg/L)	1 - 4	2 (19)	
Secchi (ft)	10.2 - 15.4	12.6 (18)	
Secchi (m)	3.1 - 4.7	3.8 (18)	
Color (Pt-Co Units)	8 - 11	10 (9)	
Specific Conductance (µS/cm@25 C)	182 - 204	194 (3)	
Lake Classification	Clear Hardwater		

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	Polk
Name	Dexter
GNIS Number	281544
Latitude	27.9936
Longitude	-81.6775
Water Body Type	Lake
Surface Area (ha and acre)	70 ha or 173 acre
Period of Record (year)	1992 to 2010
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	10 (7 to 13)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	438 (382 to 500)



- 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 Dexter 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,  $R^2 = 0.59$ , p = 0.00), total nitrogen (TN No Trend,  $R^2 = 0.01$ , p = 0.77), chlorophyll (CHL No Trend,  $R^2 = 0.07$ , p = 0.27) and Secchi depth (Secchi No Trend,  $R^2 = 0.00$ , p = 0.91).



### Florida LAKEWATCH Report for Dinner in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	27 - 40	32 (3)	
Total Nitrogen (µg/L)	820 - 1044	943 (3)	
Chlorophyll- uncorrected (µg/L)	13 - 35	18 (3)	
Secchi (ft)	3.7 - 4.1	4.0 (3)	
Secchi (m)	1.1 - 1.3	1.2 (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 ( $\mu g/L$ : 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	Polk
Name	Dinner
GNIS Number	281574
Latitude	27.9937
Longitude	-81.7853
Water Body Type	Lake
Surface Area (ha and acre)	8.8 ha or 21 acre
Period of Record (year)	2019 to 2021
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	32 (27 to 40)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	943 (820 to 1044)



- 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 Eagle in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	19 - 30	23 (12)	
Total Nitrogen (µg/L)	645 - 1148	903 (12)	
Chlorophyll- uncorrected (µg/L)	11 - 44	22 (12)	
Secchi (ft)	2.6 - 6.8	4.0 (12)	
Secchi (m)	0.8 - 2.1	1.2 (12)	
Color (Pt-Co Units)	9 - 14	11 (5)	
Specific Conductance (µS/cm@25 C)	256 - 264	259 (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 (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	Polk
Name	Eagle
GNIS Number	281921
Latitude	27.9968
Longitude	-81.7650
Water Body Type	Lake
Surface Area (ha and acre)	279 ha or 689 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	23 (19 to 30)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	903 (645 to 1148)



- 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 Eagle 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 = 0.83), total nitrogen (TN No Trend,  $R^2 = 0.09$ , p = 0.34), chlorophyll (CHL No Trend,  $R^2 = 0.09$ , p = 0.33) and Secchi depth (Secchi No Trend,  $R^2 = 0.10$ , p = 0.32).



### Florida LAKEWATCH Report for Easy in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 12	12 (1)
Total Nitrogen (µg/L)	466 - 466	466 (1)
Chlorophyll- uncorrected (µg/L)	7 - 7	7 (1)
Secchi (ft)	7.6 - 7.6	7.6 (1)
Secchi (m)	2.3 - 2.3	2.3 (1)
Color (Pt-Co Units)	7 - 7	7 (1)
Specific Conductance (µS/cm@25 C)	201 - 201	201 (1)
Lake Classification	Clear Hardwater	

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	Polk
Name	Easy
GNIS Number	282050
Latitude	27.8531
Longitude	-81.5620
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2008 to 2008
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	12 (12 to 12)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	466 (466 to 466)



- 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 Elbert in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 20	16 (6)
Total Nitrogen (µg/L)	413 - 629	513 (6)
Chlorophyll- uncorrected (µg/L)	3 - 11	7 (6)
Secchi (ft)	6.8 - 8.1	7.7 (5)
Secchi (m)	2.1 - 2.5	2.3 (5)
Color (Pt-Co Units)	12 - 12	12 (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	Polk
Name	Elbert
GNIS Number	282136
Latitude	28.0227
Longitude	-81.7150
Water Body Type	Lake
Surface Area (ha and acre)	70 ha or 173 acre
Period of Record (year)	1991 to 2001
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	16 (12 to 20)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	513 (413 to 629)



- 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 Elbert 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,  $R^2 = 0.02$ , p = 0.79), total nitrogen (TN No Trend,  $R^2 = 0.43$ , p = 0.16), chlorophyll (CHL Increasing,  $R^2 = 0.71$ , p = 0.03) and Secchi depth (Secchi No Trend,  $R^2 = 0.54$ , p = 0.16).



### Florida LAKEWATCH Report for Eloise in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	28 - 53	33 (17)	
Total Nitrogen (µg/L)	980 - 1576	1273 (17)	
Chlorophyll- uncorrected (µg/L)	23 - 58	41 (17)	
Secchi (ft)	2.0 - 3.5	2.7 (17)	
Secchi (m)	0.6 - 1.1	0.8 (17)	
Color (Pt-Co Units)	11 - 23	15 (12)	
Specific Conductance (µS/cm@25 C)	220 - 306	267 (12)	
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	Polk
Name	Eloise
GNIS Number	282184
Latitude	27.9911
Longitude	-81.7040
Water Body Type	Lake
Surface Area (ha and acre)	469 ha or 1160 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	33 (28 to 53)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1273 (980 to 1576)



- 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 Eloise 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,  $R^2 = 0.16$ , p = 0.11), total nitrogen (TN No Trend,  $R^2 = 0.10$ , p = 0.21), chlorophyll (CHL Decreasing,  $R^2 = 0.28$ , p = 0.03) and Secchi depth (Secchi No Trend,  $R^2 = 0.12$ , p = 0.18).



### Florida LAKEWATCH Report for Eva in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	59 - 59	<b>59 (1)</b>
Total Nitrogen (µg/L)	1313 - 1313	1313 (1)
Chlorophyll- uncorrected (µg/L)	39 - 39	39 (1)
Secchi (ft)	1.9 - 1.9	1.9 (1)
Secchi (m)	0.6 - 0.6	0.6 (1)
Color (Pt-Co Units)	16 - 16	16 (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	Polk
Name	Eva
GNIS Number	294617
Latitude	28.0925
Longitude	-81.6273
Water Body Type	Lake
Surface Area (ha and acre)	69 ha or 173 acre
Period of Record (year)	2006 to 2006
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	59 (59 to 59)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1313 (1313 to 1313)



- 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 Fannie in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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)	23 - 57	34 (15)
Total Nitrogen (µg/L)	691 - 1121	884 (15)
Chlorophyll- uncorrected ( $\mu$ g/L)	8 - 29	17 (15)
Secchi (ft)	1.8 - 4.8	2.8 (15)
Secchi (m)	0.5 - 1.5	0.8 (15)
Color (Pt-Co Units)	34 - 53	41 (5)
Specific Conductance (µS/cm@25 C)	204 - 220	212 (4)
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	Polk
Name	Fannie
GNIS Number	282375
Latitude	28.0522
Longitude	-81.6915
Water Body Type	Lake
Surface Area (ha and acre)	335 ha or 829 acre
Period of Record (year)	1990 to 2022
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	34 (23 to 57)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	884 (691 to 1121)



- 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 Fannie 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 Decreasing,  $R^2 = 0.27$ , p = 0.05), total nitrogen (TN Decreasing,  $R^2 = 0.41$ , p = 0.01), chlorophyll (CHL Decreasing,  $R^2 = 0.34$ , p = 0.02) and Secchi depth (Secchi Increasing,  $R^2 = 0.70$ , p = 0.00).



## Florida LAKEWATCH Report for Fauna in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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)	73 - 374	149 (30)
Total Nitrogen (µg/L)	953 - 2020	1328 (30)
Chlorophyll- uncorrected (µg/L)	22 - 114	46 (30)
Secchi (ft)	1.0 - 3.9	2.5 (30)
Secchi (m)	0.3 - 1.2	0.8 (30)
Color (Pt-Co Units)	14 - 26	19 (21)
Specific Conductance (µS/cm@25 C)	157 - 282	214 (15)
Lake Classification	Clear Hardwater	

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	Polk
Name	Fauna
GNIS Number	
Latitude	27.8778
Longitude	-81.8547
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	149 (73 to 374)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1328 (953 to 2020)



- 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 Fauna 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,  $R^2 = 0.19$ , p = 0.02), total nitrogen (TN No Trend,  $R^2 = 0.11$ , p = 0.07), chlorophyll (CHL No Trend,  $R^2 = 0.02$ , p = 0.49) and Secchi depth (Secchi Decreasing,  $R^2 = 0.18$ , p = 0.02).



## Florida LAKEWATCH Report for Flora in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	173 - 388	256 (32)
Total Nitrogen (µg/L)	1730 - 2875	2175 (32)
Chlorophyll- uncorrected (µg/L)	52 - 161	98 (32)
Secchi (ft)	1.0 - 2.7	1.4 (32)
Secchi (m)	0.3 - 0.8	0.4 (32)
Color (Pt-Co Units)	13 - 28	22 (22)
Specific Conductance (µS/cm@25 C)	145 - 200	170 (16)
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	Polk
Name	Flora
GNIS Number	
Latitude	27.8736
Longitude	-81.8504
Water Body Type	Lake
Surface Area (ha and acre)	8 ha or 20 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	256 (173 to 388)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2175 (1730 to 2875)



- 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 Flora 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,  $R^2 = 0.11$ , p = 0.07), total nitrogen (TN Increasing,  $R^2 = 0.18$ , p = 0.02), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.63) and Secchi depth (Secchi Decreasing,  $R^2 = 0.47$ , p = 0.00).



## Florida LAKEWATCH Report for Garfield in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	86 - 240	132 (4)
Total Nitrogen (µg/L)	1100 - 1617	1299 (4)
Chlorophyll- uncorrected ( $\mu$ g/L)	6 - 16	11 (4)
Secchi (ft)	2.0 - 2.5	2.2 (4)
Secchi (m)	0.6 - 0.8	0.7 (4)
Color (Pt-Co Units)	101 - 192	128 (3)
Specific Conductance (µS/cm@25 C)	143 - 148	145 (2)
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	Polk
Name	Garfield
GNIS Number	282940
Latitude	27.9088
Longitude	-81.7340
Water Body Type	Lake
Surface Area (ha and acre)	265 ha or 655 acre
Period of Record (year)	2001 to 2011
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	132 (86 to 240)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1299 (1100 to 1617)



- 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 Gaskin's Cut in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	220 - 506	321 (32)
Total Nitrogen (µg/L)	1681 - 3189	2279 (32)
Chlorophyll- uncorrected (µg/L)	57 - 169	103 (32)
Secchi (ft)	1.0 - 2.7	1.4 (32)
Secchi (m)	0.3 - 0.8	0.4 (32)
Color (Pt-Co Units)	18 - 28	23 (22)
Specific Conductance (µS/cm@25 C)	148 - 210	177 (16)
Lake Classification	Clear Hardwater	

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	Polk
Name	Gaskin's Cut
GNIS Number	
Latitude	27.8744
Longitude	-81.8540
Water Body Type	Lake
Surface Area (ha and acre)	4 ha or 9 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	321 (220 to 506)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2279 (1681 to 3189)



- 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 Gaskin's Cut 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 = 0.92), total nitrogen (TN Increasing,  $R^2 = 0.22$ , p = 0.01), chlorophyll (CHL No Trend,  $R^2 = 0.03$ , p = 0.34) and Secchi depth (Secchi Decreasing,  $R^2 = 0.48$ , p = 0.00).



# Florida LAKEWATCH Report for Gibson in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	101 - 227	136 (10)
Total Nitrogen (µg/L)	573 - 923	687 (10)
Chlorophyll- uncorrected (µg/L)	6 - 53	13 (10)
Secchi (ft)	2.7 - 5.1	3.6 (9)
Secchi (m)	0.8 - 1.5	1.1 (9)
Color (Pt-Co Units)	16 - 43	26 (7)
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	Polk
Name	Gibson
GNIS Number	283058
Latitude	28.1059
Longitude	-81.9631
Water Body Type	Lake
Surface Area (ha and acre)	192 ha or 474 acre
Period of Record (year)	1990 to 2008
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	136 (101 to 227)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	687 (573 to 923)



- 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 Gibson 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 Decreasing,  $R^2 = 0.70$ , p = 0.00), total nitrogen (TN No Trend,  $R^2 = 0.32$ , p = 0.09), chlorophyll (CHL No Trend,  $R^2 = 0.38$ , p = 0.06) and Secchi depth (Secchi No Trend,  $R^2 = 0.04$ , p = 0.59).



# Florida LAKEWATCH Report for Haines in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	47 - 147	81 (13)	
Total Nitrogen (µg/L)	1045 - 1915	1391 (13)	
Chlorophyll- uncorrected (µg/L)	38 - 96	60 (13)	
Secchi (ft)	1.5 - 2.4	2.0 (12)	
Secchi (m)	0.4 - 0.7	0.6 (12)	
Color (Pt-Co Units)	23 - 84	49 (3)	
Specific Conductance (µS/cm@25 C)	-	(0)	
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	Polk
Name	Haines
GNIS Number	283592
Latitude	28.0844
Longitude	-81.7120
Water Body Type	Lake
Surface Area (ha and acre)	303 ha or 749 acre
Period of Record (year)	1991 to 2004
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	81 (47 to 147)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1391 (1045 to 1915)



- 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 Haines 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 Decreasing,  $R^2 = 0.75$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.47$ , p = 0.01), chlorophyll (CHL Decreasing,  $R^2 = 0.52$ , p = 0.01) and Secchi depth (Secchi Increasing,  $R^2 = 0.38$ , p = 0.03).


### Florida LAKEWATCH Report for Haines-Cove in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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)	44 - 181	86 (10)
Total Nitrogen (µg/L)	1130 - 2145	1431 (10)
Chlorophyll- uncorrected (µg/L)	29 - 110	55 (10)
Secchi (ft)	1.4 - 2.3	1.9 (9)
Secchi (m)	0.4 - 0.7	0.6 (9)
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	Polk
Name	Haines-Cove
GNIS Number	283592
Latitude	28.0945
Longitude	-81.7168
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2004
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	86 (44 to 181)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1431 (1130 to 2145)



- 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 Haines-Cove 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 Decreasing,  $R^2 = 0.82$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.61$ , p = 0.01), chlorophyll (CHL Decreasing,  $R^2 = 0.72$ , p = 0.00) and Secchi depth (Secchi No Trend,  $R^2 = 0.34$ , p = 0.10).



## Florida LAKEWATCH Report for Haines-Golf Club in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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)	41 - 203	74 (8)
Total Nitrogen (µg/L)	1100 - 2237	1422 (8)
Chlorophyll- uncorrected (µg/L)	31 - 141	57 (8)
Secchi (ft)	1.2 - 2.4	1.9 (7)
Secchi (m)	0.4 - 0.7	0.6 (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	Polk
Name	Haines-Golf Club
GNIS Number	
Latitude	28.0981
Longitude	-81.7108
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1993 to 2004
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	74 (41 to 203)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1422 (1100 to 2237)



- 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 Haines-Golf Club 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 Decreasing,  $R^2 = 0.77$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.72$ , p = 0.01), chlorophyll (CHL Decreasing,  $R^2 = 0.80$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.92$ , p = 0.00).



## Florida LAKEWATCH Report for Hamilton in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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)	59 - 156	94 (4)
Total Nitrogen (µg/L)	798 - 1043	912 (4)
Chlorophyll- uncorrected (µg/L)	5 - 7	6 (4)
Secchi (ft)	3.0 - 3.9	3.4 (4)
Secchi (m)	0.9 - 1.2	1.0 (4)
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	Polk
Name	Hamilton
GNIS Number	283642
Latitude	28.0448
Longitude	-81.6567
Water Body Type	Lake
Surface Area (ha and acre)	875 ha or 2162 acre
Period of Record (year)	1991 to 1994
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	94 (59 to 156)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	912 (798 to 1043)



- 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 Hancock in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	145 - 145	145 (1)
Total Nitrogen (µg/L)	3505 - 3505	3505 (1)
Chlorophyll- uncorrected (µg/L)	91 - 91	91 (1)
Secchi (ft)	1.4 - 1.4	1.4 (1)
Secchi (m)	0.4 - 0.4	0.4 (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	Polk
Name	Hancock
GNIS Number	283683
Latitude	27.9911
Longitude	-81.8488
Water Body Type	Lake
Surface Area (ha and acre)	1829 ha or 4519 acre
Period of Record (year)	2006 to 2006
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	145 (145 to 145)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	3505 (3505 to 3505)



- 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 Hartridge in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 27	17 (5)
Total Nitrogen (µg/L)	397 - 929	605 (5)
Chlorophyll- uncorrected (µg/L)	1 - 35	8 (5)
Secchi (ft)	2.6 - 8.7	4.5 (4)
Secchi (m)	0.8 - 2.6	1.4 (4)
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	Polk
Name	Hartridge
GNIS Number	283788
Latitude	28.0511
Longitude	-81.7466
Water Body Type	Lake
Surface Area (ha and acre)	193 ha or 477 acre
Period of Record (year)	1992 to 2000
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	17 (9 to 27)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	605 (397 to 929)



- 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 Hartridge 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,  $R^2 = 0.69$ , p = 0.08), total nitrogen (TN No Trend,  $R^2 = 0.41$ , p = 0.24), chlorophyll (CHL No Trend,  $R^2 = 0.42$ , p = 0.23) and Secchi depth (Secchi No Trend,  $R^2 = 0.76$ , p = 0.13).



### Florida LAKEWATCH Report for Helen in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	11 - 19	14 (8)
Total Nitrogen (µg/L)	760 - 1359	931 (8)
Chlorophyll- uncorrected (µg/L)	5 - 12	9 (8)
Secchi (ft)	4.4 - 7.3	5.6 (8)
Secchi (m)	1.3 - 2.2	1.7 (8)
Color (Pt-Co Units)	8 - 17	10 (7)
Specific Conductance (µS/cm@25 C)	73 - 78	75 (2)
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	Polk
Name	Helen
GNIS Number	283866
Latitude	27.8286
Longitude	-81.5033
Water Body Type	Lake
Surface Area (ha and acre)	3 ha or 8 acre
Period of Record (year)	2000 to 2007
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (11 to 19)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	931 (760 to 1359)



- 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 Helen 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,  $R^2 = 0.14$ , p = 0.36), total nitrogen (TN No Trend,  $R^2 = 0.05$ , p = 0.61), chlorophyll (CHL No Trend,  $R^2 = 0.19$ , p = 0.28) and Secchi depth (Secchi No Trend,  $R^2 = 0.05$ , p = 0.61).



## Florida LAKEWATCH Report for Henry in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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)	61 - 153	105 (13)
Total Nitrogen (µg/L)	866 - 1239	1068 (13)
Chlorophyll- uncorrected (µg/L)	3 - 7	5 (13)
Secchi (ft)	1.2 - 2.1	1.5 (13)
Secchi (m)	0.4 - 0.6	0.5 (13)
Color (Pt-Co Units)	80 - 117	97 (2)
Specific Conductance (µS/cm@25 C)	-	(0)
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	Polk
Name	Henry
GNIS Number	283918
Latitude	28.0920
Longitude	-81.6574
Water Body Type	Lake
Surface Area (ha and acre)	328 ha or 812 acre
Period of Record (year)	1990 to 2002
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	105 (61 to 153)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1068 (866 to 1239)



- 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 Henry 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,  $R^2 = 0.12$ , p = 0.25), total nitrogen (TN Decreasing,  $R^2 = 0.34$ , p = 0.04), chlorophyll (CHL Increasing,  $R^2 = 0.38$ , p = 0.03) and Secchi depth (Secchi Increasing,  $R^2 = 0.33$ , p = 0.04).



## Florida LAKEWATCH Report for Hollingsworth in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	32 - 156	74 (6)	
Total Nitrogen (µg/L)	763 - 2135	1484 (6)	
Chlorophyll- uncorrected (µg/L)	19 - 124	61 (6)	
Secchi (ft)	1.4 - 4.2	1.9 (6)	
Secchi (m)	0.4 - 1.3	0.6 (6)	
Color (Pt-Co Units)	6 - 31	17 (6)	
Specific Conductance (µS/cm@25 C)	158 - 166	162 (2)	
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	Polk
Name	Hollingsworth
GNIS Number	284163
Latitude	28.0215
Longitude	-81.9465
Water Body Type	Lake
Surface Area (ha and acre)	144 ha or 356 acre
Period of Record (year)	2001 to 2008
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	74 (32 to 156)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1484 (763 to 2135)


- 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 Hollingsworth 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,  $R^2 = 0.34$ , p = 0.23), total nitrogen (TN No Trend,  $R^2 = 0.06$ , p = 0.64), chlorophyll (CHL No Trend,  $R^2 = 0.15$ , p = 0.44) and Secchi depth (Secchi No Trend,  $R^2 = 0.00$ , p = 0.97).



#### Florida LAKEWATCH Report for Howard in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	28 - 42	35 (7)
Total Nitrogen (µg/L)	1217 - 1740	1403 (7)
Chlorophyll- uncorrected (µg/L)	35 - 66	45 (7)
Secchi (ft)	2.0 - 2.4	2.1 (7)
Secchi (m)	0.6 - 0.7	0.7 (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	Polk
Name	Howard
GNIS Number	284352
Latitude	28.0299
Longitude	-81.7448
Water Body Type	Lake
Surface Area (ha and acre)	254 ha or 628 acre
Period of Record (year)	1991 to 1997
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	35 (28 to 42)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1403 (1217 to 1740)



- 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 Howard 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,  $R^2 = 0.02$ , p = 0.74), total nitrogen (TN No Trend,  $R^2 = 0.53$ , p = 0.06), chlorophyll (CHL No Trend,  $R^2 = 0.18$ , p = 0.35) and Secchi depth (Secchi No Trend,  $R^2 = 0.11$ , p = 0.47).



#### Florida LAKEWATCH Report for Hunter in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	115 - 210	160 (12)	
Total Nitrogen (µg/L)	1710 - 3300	2364 (12)	
Chlorophyll- uncorrected (µg/L)	85 - 152	117 (11)	
Secchi (ft)	0.9 - 2.0	1.3 (12)	
Secchi (m)	0.3 - 0.6	0.4 (12)	
Color (Pt-Co Units)	25 - 36	30 (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	Polk
Name	Hunter
GNIS Number	284407
Latitude	28.0346
Longitude	-81.9663
Water Body Type	Lake
Surface Area (ha and acre)	40 ha or 100 acre
Period of Record (year)	1990 to 2007
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	160 (115 to 210)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2364 (1710 to 3300)



- 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 Hunter 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 = 0.03), total nitrogen (TN Increasing,  $R^2 = 0.59$ , p = 0.00), chlorophyll (CHL No Trend,  $R^2 = 0.28$ , p = 0.09) and Secchi depth (Secchi No Trend,  $R^2 = 0.03$ , p = 0.61).



#### Florida LAKEWATCH Report for Ida in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	57 - 57	57 (1)	
Total Nitrogen (µg/L)	868 - 868	868 (1)	
Chlorophyll- uncorrected (µg/L)	24 - 24	24 (1)	
Secchi (ft)	5.0 - 5.0	5.0 (1)	
Secchi (m)	1.5 - 1.5	1.5 (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	Polk
Name	Ida
GNIS Number	284459
Latitude	27.7603
Longitude	-81.5202
Water Body Type	Lake
Surface Area (ha and acre)	34 ha or 83 acre
Period of Record (year)	1992 to 1992
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	57 (57 to 57)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	868 (868 to 868)



- 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 Idylwild in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	30 - 46	37 (3)	
Total Nitrogen (µg/L)	896 - 976	943 (3)	
Chlorophyll- uncorrected (µg/L)	29 - 38	33 (3)	
Secchi (ft)	2.5 - 3.6	2.8 (3)	
Secchi (m)	0.8 - 1.1	0.9 (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	Polk
Name	Idylwild
GNIS Number	284467
Latitude	28.0522
Longitude	-81.7574
Water Body Type	Lake
Surface Area (ha and acre)	41 ha or 102 acre
Period of Record (year)	1991 to 1999
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	37 (30 to 46)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	943 (896 to 976)



- 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 Isabell in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	32 - 32	<u>32 (1)</u>	
Total Nitrogen (µg/L)	896 - 896	896 (1)	
Chlorophyll- uncorrected (µg/L)	14 - 14	14 (1)	
Secchi (ft)	3.2 - 3.2	3.2 (1)	
Secchi (m)	1.0 - 1.0	1.0 (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	Polk
Name	Isabell
GNIS Number	284603
Latitude	27.6522
Longitude	-81.4772
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2018 to 2018
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	32 (32 to 32)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	896 (896 to 896)



- 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 Jessie in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	53 - 88	70 (6)
Total Nitrogen (µg/L)	922 - 1175	1083 (6)
Chlorophyll- uncorrected (µg/L)	22 - 45	29 (6)
Secchi (ft)	2.2 - 3.5	2.5 (6)
Secchi (m)	0.7 - 1.1	0.8 (6)
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.
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- 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	Polk
Name	Jessie
GNIS Number	284779
Latitude	28.0551
Longitude	-81.7631
Water Body Type	Lake
Surface Area (ha and acre)	77 ha or 190 acre
Period of Record (year)	1992 to 1998
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	70 (53 to 88)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1083 (922 to 1175)



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- 2. Identify your waterbody's Grand Geometric Mean Chlorophyll-uncorrected in Table 2.
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- 4. Repeat these same steps with the TN Zone and Long-term Grand Geometric Mean TN Concentration

Figure 2. Lake Jessie 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,  $R^2 = 0.33$ , p = 0.24), total nitrogen (TN No Trend,  $R^2 = 0.01$ , p = 0.83), chlorophyll (CHL No Trend,  $R^2 = 0.52$ , p = 0.10) and Secchi depth (Secchi Decreasing,  $R^2 = 0.67$ , p = 0.05).



#### Florida LAKEWATCH Report for John in Polk County Using Data Downloaded 12/9/2022

#### **Introduction for Lakes**

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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.

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- **Color (Pt-Co Units):** LAKEWATCH measures true color, which is the color of the water after particles have been filtered out.
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Long Term Geometric	Annual	Minimum calculated		Maximum calculated	
Mean Lake Color and Long-	Geometric	numeric int	erpretation	numeric in	terpretation
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)	217 - 239	230 (3)
Total Nitrogen (µg/L)	956 - 1132	1057 (3)
Chlorophyll- uncorrected (µg/L)	35 - 61	48 (3)
Secchi (ft)	2.5 - 2.7	2.6 (3)
Secchi (m)	0.8 - 0.8	0.8 (3)
Color (Pt-Co Units)	27 - 32	29 (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	Polk
Name	John
GNIS Number	284847
Latitude	27.9959
Longitude	-81.9423
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2003 to 2005
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	230 (217 to 239)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1057 (956 to 1132)



- 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 Josephine in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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 - 10	9 (2)
Total Nitrogen (µg/L)	901 - 1834	1285 (2)
Chlorophyll- uncorrected (µg/L)	5 - 7	6 (2)
Secchi (ft)	8.1 - 8.5	8.3 (2)
Secchi (m)	2.5 - 2.6	2.5 (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 ( $\mu g/L$ : 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	Polk
Name	Josephine
GNIS Number	
Latitude	27.8645
Longitude	-81.5758
Water Body Type	Lake
Surface Area (ha and acre)	11 ha or 26 acre
Period of Record (year)	1999 to 2000
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	9 (8 to 10)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1285 (901 to 1834)


- 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 Juliana in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 25	25 (1)	
Total Nitrogen (µg/L)	742 - 742	742 (1)	
Chlorophyll- uncorrected (µg/L)	23 - 23	23 (1)	
Secchi (ft)	4.0 - 4.0	4.0 (1)	
Secchi (m)	1.2 - 1.2	1.2 (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	Polk
Name	Juliana
GNIS Number	284964
Latitude	28.1384
Longitude	-81.8044
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1997 to 1997
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	25 (25 to 25)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	742 (742 to 742)



- 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 Link in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	17 - 30	24 (3)	
Total Nitrogen (µg/L)	679 - 757	710 (3)	
Chlorophyll- uncorrected (µg/L)	4 - 18	11 (3)	
Secchi (ft)	4.0 - 4.7	4.4 (3)	
Secchi (m)	1.2 - 1.4	1.3 (3)	
Color (Pt-Co Units)	18 - 18	18 (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 (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	Polk
Name	Link
GNIS Number	285565
Latitude	28.0182
Longitude	-81.7055
Water Body Type	Lake
Surface Area (ha and acre)	11 ha or 27 acre
Period of Record (year)	1991 to 2007
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	24 (17 to 30)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	710 (679 to 757)



- 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 Little Bass in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	235 - 497	335 (32)
Total Nitrogen (µg/L)	1645 - 3302	2284 (32)
Chlorophyll- uncorrected (µg/L)	54 - 176	106 (32)
Secchi (ft)	0.9 - 2.7	1.4 (32)
Secchi (m)	0.3 - 0.8	0.4 (32)
Color (Pt-Co Units)	17 - 30	23 (22)
Specific Conductance (µS/cm@25 C)	148 - 210	176 (16)
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	Polk
Name	Little Bass
GNIS Number	
Latitude	27.8753
Longitude	-81.8525
Water Body Type	Lake
Surface Area (ha and acre)	2 ha or 4 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	335 (235 to 497)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2284 (1645 to 3302)



- 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 Bass 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 Increasing,  $R^2 = 0.20$ , p = 0.01), chlorophyll (CHL No Trend,  $R^2 = 0.06$ , p = 0.17) and Secchi depth (Secchi Decreasing,  $R^2 = 0.49$ , p = 0.00).



### Florida LAKEWATCH Report for Little Crooked in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	23 - 69	44 (9)
Total Nitrogen (µg/L)	878 - 1980	1103 (9)
Chlorophyll- uncorrected ( $\mu$ g/L)	7 - 37	15 (8)
Secchi (ft)	1.8 - 3.5	2.4 (9)
Secchi (m)	0.5 - 1.1	0.7 (9)
Color (Pt-Co Units)	28 - 192	106 (4)
Specific Conductance (µS/cm@25 C)	136 - 136	136 (1)
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	Polk
Name	Little Crooked
GNIS Number	2770882
Latitude	27.7726
Longitude	-81.5753
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2000 to 2011
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	44 (23 to 69)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1103 (878 to 1980)



- 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 Crooked 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,  $R^2 = 0.29$ , p = 0.14), total nitrogen (TN Increasing,  $R^2 = 0.62$ , p = 0.01), chlorophyll (CHL No Trend,  $R^2 = 0.16$ , p = 0.33) and Secchi depth (Secchi No Trend,  $R^2 = 0.15$ , p = 0.30).



### Florida LAKEWATCH Report for Little Elbert in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	24 - 24	24 (1)
Total Nitrogen (µg/L)	977 - 977	977 (1)
Chlorophyll- uncorrected (µg/L)	31 - 31	31 (1)
Secchi (ft)	3.6 - 3.6	3.6 (1)
Secchi (m)	1.1 - 1.1	1.1 (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	Polk
Name	Little Elbert
GNIS Number	
Latitude	28.0236
Longitude	-81.7154
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1994 to 1994
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	24 (24 to 24)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	977 (977 to 977)



- 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 Little Hamilton in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	31 - 32	<u>31 (2)</u>	
Total Nitrogen (µg/L)	620 - 700	659 (2)	
Chlorophyll- uncorrected (µg/L)	17 - 21	19 (2)	
Secchi (ft)	3.1 - 3.5	3.3 (2)	
Secchi (m)	0.9 - 1.1	1.0 (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 ( $\mu g/L$ : 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	Polk
Name	Little Hamilton
GNIS Number	285728
Latitude	28.0759
Longitude	-81.6341
Water Body Type	Lake
Surface Area (ha and acre)	149 ha or 367 acre
Period of Record (year)	1990 to 1991
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	31 (31 to 32)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	659 (620 to 700)



- 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 Little Otis in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	18 - 31	24 (2)
Total Nitrogen (µg/L)	659 - 707	683 (2)
Chlorophyll- uncorrected (µg/L)	13 - 13	13 (2)
Secchi (ft)	5.0 - 5.6	5.3 (2)
Secchi (m)	1.5 - 1.7	1.6 (2)
Color (Pt-Co Units)	16 - 16	16 (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	Polk
Name	Little Otis
GNIS Number	288273
Latitude	28.0113
Longitude	-81.7094
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2005
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	24 (18 to 31)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	683 (659 to 707)



- 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 Little Spirit in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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)	20 - 26	22 (3)	
Total Nitrogen (µg/L)	704 - 830	775 (3)	
Chlorophyll- uncorrected (µg/L)	3 - 6	4 (3)	
Secchi (ft)	8.0 - 8.0	8.0 (1)	
Secchi (m)	2.4 - 2.4	2.4 (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 (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	Polk
Name	Little Spirit
GNIS Number	291503
Latitude	27.9972
Longitude	-81.7828
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 1993
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	22 (20 to 26)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	775 (704 to 830)



- 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 Little Winterset in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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                   |              |                    |             |                        |            |
| <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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	13 - 20	15 (7)
Total Nitrogen (µg/L)	496 - 867	618 (7)
Chlorophyll- uncorrected (µg/L)	4 - 19	7 (7)
Secchi (ft)	4.0 - 12.6	8.9 (7)
Secchi (m)	1.2 - 3.8	2.7 (7)
Color (Pt-Co Units)	7 - 14	9 (6)
Specific Conductance (µS/cm@25 C)	256 - 283	273 (6)
Lake Classification	Clear Hardwater	

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	Polk
Name	Little Winterset
GNIS Number	293430
Latitude	27.9658
Longitude	-81.6812
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1991 to 2020
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	15 (13 to 20)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	618 (496 to 867)



- 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 Winterset 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 Decreasing,  $R^2 = 0.86$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.79$ , p = 0.01), chlorophyll (CHL Decreasing,  $R^2 = 0.96$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.82$ , p = 0.00).



## Florida LAKEWATCH Report for Livingston in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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)	374 - 398	386 (2)
Total Nitrogen (µg/L)	1628 - 1727	1676 (2)
Chlorophyll- uncorrected (µg/L)	3 - 6	4 (2)
Secchi (ft)	1.0 - 1.2	1.1 (2)
Secchi (m)	0.3 - 0.4	0.3 (2)
Color (Pt-Co Units)	445 - 445	445 (1)
Specific Conductance (µS/cm@25 C)	-	(0)
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	Polk
Name	Livingston
GNIS Number	285891
Latitude	27.6936
Longitude	-81.5212
Water Body Type	Lake
Surface Area (ha and acre)	487 ha or 1203 acre
Period of Record (year)	2001 to 2002
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	386 (374 to 398)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1676 (1628 to 1727)



- 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 Lizzie in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	14 - 16	15 (2)
Total Nitrogen (µg/L)	658 - 672	665 (2)
Chlorophyll- uncorrected (µg/L)	4 - 7	5 (2)
Secchi (ft)	9.2 - 9.8	9.5 (2)
Secchi (m)	2.8 - 3.0	2.9 (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 ( $\mu g/L$ : 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	Polk
Name	Lizzie
GNIS Number	285894
Latitude	27.8195
Longitude	-81.6695
Water Body Type	Lake
Surface Area (ha and acre)	38 ha or 95 acre
Period of Record (year)	1996 to 1997
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	15 (14 to 16)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	665 (658 to 672)



- 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 Lost in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	34 - 53	40 (3)
Total Nitrogen (µg/L)	1100 - 1210	1140 (3)
Chlorophyll- uncorrected (µg/L)	60 - 89	68 (3)
Secchi (ft)	1.4 - 1.5	1.4 (3)
Secchi (m)	0.4 - 0.5	0.4 (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	Polk
Name	Lost
GNIS Number	
Latitude	27.8155
Longitude	-81.4776
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1998 to 2000
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	40 (34 to 53)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1140 (1100 to 1210)



- 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 Lucerne in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 13	10 (6)
Total Nitrogen (µg/L)	415 - 599	503 (6)
Chlorophyll- uncorrected (µg/L)	1 - 6	2 (6)
Secchi (ft)	7.9 - 14.0	10.6 (6)
Secchi (m)	2.4 - 4.3	3.2 (6)
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	Polk
Name	Lucerne
GNIS Number	286192
Latitude	28.0784
Longitude	-81.6839
Water Body Type	Lake
Surface Area (ha and acre)	17 ha or 42 acre
Period of Record (year)	1990 to 2000
Lake Trophic Status (CHL)	Oligotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	10 (8 to 13)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	503 (415 to 599)



- 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 Lucerne 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,  $R^2 = 0.87$ , p = 0.01), total nitrogen (TN Increasing,  $R^2 = 0.69$ , p = 0.04), chlorophyll (CHL Increasing,  $R^2 = 0.78$ , p = 0.02) and Secchi depth (Secchi Decreasing,  $R^2 = 0.87$ , p = 0.01).



## Florida LAKEWATCH Report for Lulu in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	28 - 58	43 (25)
Total Nitrogen (µg/L)	966 - 1478	1211 (25)
Chlorophyll- uncorrected (µg/L)	21 - 49	35 (25)
Secchi (ft)	1.8 - 3.7	2.5 (25)
Secchi (m)	0.6 - 1.1	0.8 (25)
Color (Pt-Co Units)	13 - 31	20 (14)
Specific Conductance (µS/cm@25 C)	209 - 275	230 (11)
Lake Classification	Clear Hardwater	

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	Polk
Name	Lulu
GNIS Number	286210
Latitude	27.9967
Longitude	-81.7266
Water Body Type	Lake
Surface Area (ha and acre)	122 ha or 301 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	43 (28 to 58)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1211 (966 to 1478)



- 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 Lulu 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 Decreasing,  $R^2 = 0.69$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.25$ , p = 0.01), chlorophyll (CHL Decreasing,  $R^2 = 0.49$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.39$ , p = 0.00).



# Florida LAKEWATCH Report for Mabel in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	17 - 17	17 (1)	
Total Nitrogen (µg/L)	983 - 983	983 (1)	
Chlorophyll- uncorrected (µg/L)	26 - 26	26 (1)	
Secchi (ft)	3.0 - 3.0	3.0 (1)	
Secchi (m)	0.9 - 0.9	0.9 (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 (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	Polk
Name	Mabel
GNIS Number	286235
Latitude	27.9714
Longitude	-81.5911
Water Body Type	Lake
Surface Area (ha and acre)	47 ha or 117 acre
Period of Record (year)	1991 to 1991
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	17 (17 to 17)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	983 (983 to 983)



- 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 Marianna in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	24 - 42	29 (12)	
Total Nitrogen (µg/L)	849 - 1693	1279 (12)	
Chlorophyll- uncorrected (µg/L)	12 - 44	32 (12)	
Secchi (ft)	1.9 - 3.3	2.3 (12)	
Secchi (m)	0.6 - 1.0	0.7 (12)	
Color (Pt-Co Units)	13 - 28	18 (10)	
Specific Conductance (µS/cm@25 C)	168 - 286	222 (9)	
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	Polk	
Name	Marianna	
GNIS Number	286421	
Latitude	28.0698	
Longitude	-81.7586	
Water Body Type	Lake	
Surface Area (ha and acre)	204 ha or 503 acre	
Period of Record (year)	1991 to 2022	
Lake Trophic Status (CHL)	Eutrophic	
TP Zone	TP4	
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	29 (24 to 42)	
TN Zone	TN4	
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1279 (849 to 1693)	



- 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 Marianna 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,  $R^2 = 0.30$ , p = 0.07), total nitrogen (TN Increasing,  $R^2 = 0.53$ , p = 0.01), chlorophyll (CHL Increasing,  $R^2 = 0.44$ , p = 0.02) and Secchi depth (Secchi Decreasing,  $R^2 = 0.62$ , p = 0.00).



# Florida LAKEWATCH Report for Marion in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	46 - 88	62 (3)	
Total Nitrogen (µg/L)	1197 - 2566	1674 (3)	
Chlorophyll- uncorrected (µg/L)	29 - 81	54 (3)	
Secchi (ft)	1.3 - 3.2	2.0 (3)	
Secchi (m)	0.4 - 1.0	0.6 (3)	
Color (Pt-Co Units)	33 - 48	40 (2)	
Specific Conductance (µS/cm@25 C)	199 - 199	199 (1)	
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	Polk
Name	Marion
GNIS Number	286432
Latitude	28.0957
Longitude	-81.5364
Water Body Type	Lake
Surface Area (ha and acre)	1210 ha or 2990 acre
Period of Record (year)	2001 to 2017
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	62 (46 to 88)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1674 (1197 to 2566)



- 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 Mattie in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	90 - 102	97 (3)
Total Nitrogen (µg/L)	1080 - 1187	1130 (3)
Chlorophyll- uncorrected (µg/L)	9 - 29	17 (3)
Secchi (ft)	0.9 - 1.8	1.4 (3)
Secchi (m)	0.3 - 0.6	0.4 (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	Polk
Name	Mattie
GNIS Number	286526
Latitude	28.1493
Longitude	-81.7846
Water Body Type	Lake
Surface Area (ha and acre)	436 ha or 1078 acre
Period of Record (year)	1997 to 1999
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	97 (90 to 102)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1130 (1080 to 1187)



- 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 Maude in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	27 - 54	37 (12)
Total Nitrogen (µg/L)	612 - 1091	742 (12)
Chlorophyll- uncorrected (µg/L)	4 - 16	9 (12)
Secchi (ft)	6.0 - 7.4	6.7 (12)
Secchi (m)	1.8 - 2.3	2.0 (12)
Color (Pt-Co Units)	12 - 19	16 (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	Polk
Name	Maude
GNIS Number	286529
Latitude	28.0381
Longitude	-81.7210
Water Body Type	Lake
Surface Area (ha and acre)	22 ha or 55 acre
Period of Record (year)	1991 to 2002
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	37 (27 to 54)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	742 (612 to 1091)



- 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 Maude 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 = 0.84), total nitrogen (TN No Trend,  $R^2 = 0.09$ , p = 0.33), chlorophyll (CHL No Trend,  $R^2 = 0.08$ , p = 0.36) and Secchi depth (Secchi No Trend,  $R^2 = 0.26$ , p = 0.09).



## Florida LAKEWATCH Report for May in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	50 - 74	61 (5)
Total Nitrogen (µg/L)	1255 - 1717	1467 (5)
Chlorophyll- uncorrected (µg/L)	42 - 64	50 (5)
Secchi (ft)	1.5 - 2.9	1.9 (5)
Secchi (m)	0.4 - 0.9	0.6 (5)
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	Polk
Name	May
GNIS Number	286540
Latitude	28.0154
Longitude	-81.7368
Water Body Type	Lake
Surface Area (ha and acre)	18 ha or 44 acre
Period of Record (year)	1991 to 2000
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	61 (50 to 74)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1467 (1255 to 1717)



- 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 May 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 Decreasing,  $R^2 = 0.78$ , p = 0.05), total nitrogen (TN No Trend,  $R^2 = 0.64$ , p = 0.10), chlorophyll (CHL No Trend,  $R^2 = 0.42$ , p = 0.23) and Secchi depth (Secchi No Trend,  $R^2 = 0.28$ , p = 0.36).



### Florida LAKEWATCH Report for McLeod in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	14 - 14	14 (1)
Total Nitrogen (µg/L)	474 - 474	474 (1)
Chlorophyll- uncorrected (µg/L)	5 - 5	5 (1)
Secchi (ft)	13.4 - 13.4	13.4 (1)
Secchi (m)	4.1 - 4.1	4.1 (1)
Color (Pt-Co Units)	8 - 8	8 (1)
Specific Conductance (µS/cm@25 C)	205 - 205	205 (1)
Lake Classification	Clear Hardwater	

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	Polk
Name	McLeod
GNIS Number	286641
Latitude	27.9720
Longitude	-81.7502
Water Body Type	Lake
Surface Area (ha and acre)	209 ha or 512 acre
Period of Record (year)	2010 to 2010
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (14 to 14)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	474 (474 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.

# Florida LAKEWATCH Report for Mirror in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	31 - 35	<u>33 (2)</u>
Total Nitrogen (µg/L)	1188 - 1455	1315 (2)
Chlorophyll- uncorrected (µg/L)	33 - 47	39 (2)
Secchi (ft)	2.1 - 2.9	2.5 (2)
Secchi (m)	0.6 - 0.9	0.8 (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 ( $\mu g/L$ : 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	Polk
Name	Mirror
GNIS Number	286985
Latitude	28.0358
Longitude	-81.7409
Water Body Type	Lake
Surface Area (ha and acre)	50 ha or 123 acre
Period of Record (year)	1991 to 1992
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	33 (31 to 35)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1315 (1188 to 1455)



- 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 Mountain 2 in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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)	39 - 56	45 (5)
Total Nitrogen (µg/L)	550 - 786	654 (5)
Chlorophyll- uncorrected (µg/L)	6 - 37	14 (5)
Secchi (ft)	3.8 - 11.4	6.3 (5)
Secchi (m)	1.2 - 3.5	1.9 (5)
Color (Pt-Co Units)	5 - 13	8 (5)
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	Polk
Name	Mountain 2
GNIS Number	
Latitude	27.9549
Longitude	-81.9556
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2001 to 2005
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	45 (39 to 56)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	654 (550 to 786)



- 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 Mountain 2 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 Decreasing,  $R^2 = 0.78$ , p = 0.05), total nitrogen (TN Decreasing,  $R^2 = 0.97$ , p = 0.00), chlorophyll (CHL Decreasing,  $R^2 = 0.91$ , p = 0.01) and Secchi depth (Secchi Increasing,  $R^2 = 0.84$ , p = 0.03).



## Florida LAKEWATCH Report for Ned in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	22 - 22	22 (1)
Total Nitrogen (µg/L)	633 - 633	633 (1)
Chlorophyll- uncorrected (µg/L)	8 - 8	8 (1)
Secchi (ft)	9.8 - 9.8	9.8 (1)
Secchi (m)	3.0 - 3.0	3.0 (1)
Color (Pt-Co Units)	22 - 22	22 (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	Polk
Name	Ned
GNIS Number	287566
Latitude	27.9940
Longitude	-81.6686
Water Body Type	Lake
Surface Area (ha and acre)	30 ha or 74 acre
Period of Record (year)	2002 to 2002
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	22 (22 to 22)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	633 (633 to 633)



- 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 ORO Canal-1 in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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)	34 - 34	34 (1)
Total Nitrogen (µg/L)	1048 - 1048	1048 (1)
Chlorophyll- uncorrected (µg/L)	11 - 11	11 (1)
Secchi (ft)	1.7 - 1.7	1.7 (1)
Secchi (m)	0.5 - 0.5	0.5 (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	Polk
Name	ORO Canal-1
GNIS Number	
Latitude	28.3444
Longitude	-81.6627
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2021 to 2021
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	34 (34 to 34)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1048 (1048 to 1048)



- 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 ORO Canal-2 in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	22 - 22	22 (1)
Total Nitrogen (µg/L)	839 - 839	839 (1)
Chlorophyll- uncorrected (µg/L)	20 - 20	20 (1)
Secchi (ft)	2.6 - 2.6	2.6 (1)
Secchi (m)	0.8 - 0.8	0.8 (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	Polk
Name	ORO Canal-2
GNIS Number	
Latitude	28.3418
Longitude	-81.6627
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2021 to 2021
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	22 (22 to 22)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	839 (839 to 839)



- 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 ORO Canal-3 in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	45 - 45	45 (1)
Total Nitrogen (µg/L)	1165 - 1165	1165 (1)
Chlorophyll- uncorrected (µg/L)	36 - 36	36 (1)
Secchi (ft)	1.7 - 1.7	1.7 (1)
Secchi (m)	0.5 - 0.5	0.5 (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	Polk
Name	ORO Canal-3
GNIS Number	
Latitude	28.3414
Longitude	-81.6607
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2021 to 2021
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	45 (45 to 45)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1165 (1165 to 1165)



- 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 Otis in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	18 - 31	26 (7)
Total Nitrogen (µg/L)	586 - 1025	686 (7)
Chlorophyll- uncorrected (µg/L)	5 - 28	16 (7)
Secchi (ft)	2.8 - 9.1	4.5 (7)
Secchi (m)	0.9 - 2.8	1.4 (7)
Color (Pt-Co Units)	14 - 28	19 (5)
Specific Conductance (µS/cm@25 C)	173 - 185	178 (4)
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	Polk
Name	Otis
GNIS Number	288273
Latitude	28.0175
Longitude	-81.7117
Water Body Type	Lake
Surface Area (ha and acre)	58 ha or 143 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	26 (18 to 31)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	686 (586 to 1025)



- 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 Otis 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,  $R^2 = 0.07$ , p = 0.58), total nitrogen (TN No Trend,  $R^2 = 0.24$ , p = 0.26), chlorophyll (CHL No Trend,  $R^2 = 0.36$ , p = 0.16) and Secchi depth (Secchi Decreasing,  $R^2 = 0.72$ , p = 0.02).



### Florida LAKEWATCH Report for Otter in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	8 - 9	9 (3)
Total Nitrogen (µg/L)	552 - 775	633 (3)
Chlorophyll- uncorrected (µg/L)	4 - 6	5 (3)
Secchi (ft)	7.6 - 9.0	8.2 (3)
Secchi (m)	2.3 - 2.7	2.5 (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	Polk
Name	Otter
GNIS Number	
Latitude	27.8083
Longitude	-81.4841
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1998 to 2000
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	9 (8 to 9)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	633 (552 to 775)



- 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 Pansy in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	27 - 46	34 (7)
Total Nitrogen (µg/L)	625 - 869	726 (7)
Chlorophyll- uncorrected (µg/L)	10 - 19	14 (7)
Secchi (ft)	2.3 - 3.5	3.1 (7)
Secchi (m)	0.7 - 1.1	0.9 (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	Polk
Name	Pansy
GNIS Number	288455
Latitude	28.0667
Longitude	-81.7427
Water Body Type	Lake
Surface Area (ha and acre)	20 ha or 50 acre
Period of Record (year)	1992 to 1998
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	34 (27 to 46)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	726 (625 to 869)



- 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 Pansy 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,  $R^2 = 0.01$ , p = 0.83), total nitrogen (TN No Trend,  $R^2 = 0.13$ , p = 0.42), chlorophyll (CHL No Trend,  $R^2 = 0.36$ , p = 0.16) and Secchi depth (Secchi Decreasing,  $R^2 = 0.69$ , p = 0.02).



# Florida LAKEWATCH Report for Parker in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	47 - 145	75 (11)
Total Nitrogen (µg/L)	2359 - 4667	2954 (11)
Chlorophyll- uncorrected (µg/L)	75 - 220	122 (11)
Secchi (ft)	0.8 - 1.5	1.2 (11)
Secchi (m)	0.3 - 0.5	0.4 (11)
Color (Pt-Co Units)	30 - 60	38 (9)
Specific Conductance (µS/cm@25 C)	203 - 268	234 (6)
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	Polk
Name	Parker
GNIS Number	288524
Latitude	28.0538
Longitude	-81.9304
Water Body Type	Lake
Surface Area (ha and acre)	919 ha or 2272 acre
Period of Record (year)	1999 to 2013
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	75 (47 to 145)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2954 (2359 to 4667)



- 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 Parker 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 Decreasing,  $R^2 = 0.57$ , p = 0.01), total nitrogen (TN No Trend,  $R^2 = 0.08$ , p = 0.39), chlorophyll (CHL No Trend,  $R^2 = 0.32$ , p = 0.07) and Secchi depth (Secchi No Trend,  $R^2 = 0.09$ , p = 0.36).



### Florida LAKEWATCH Report for Parks in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 16	8 (13)
Total Nitrogen (µg/L)	845 - 2524	1564 (13)
Chlorophyll- uncorrected (µg/L)	2 - 5	3 (13)
Secchi (ft)	10.2 - 17.7	13.1 (13)
Secchi (m)	3.1 - 5.4	4.0 (13)
Color (Pt-Co Units)	12 - 26	16 (10)
Specific Conductance (µS/cm@25 C)	186 - 208	199 (10)
Lake Classification	Clear Hardwater	

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	Polk
Name	Parks
GNIS Number	288527
Latitude	27.9151
Longitude	-81.4715
Water Body Type	Lake
Surface Area (ha and acre)	40 ha or 100 acre
Period of Record (year)	2007 to 2019
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	8 (4 to 16)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1564 (845 to 2524)



- 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 Parks 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 = 0.04), total nitrogen (TN No Trend,  $R^2 = 0.29$ , p = 0.06), chlorophyll (CHL No Trend,  $R^2 = 0.27$ , p = 0.07) and Secchi depth (Secchi No Trend,  $R^2 = 0.17$ , p = 0.16).



### Florida LAKEWATCH Report for Patrick in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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 - 13	10 (3)
Total Nitrogen (µg/L)	2327 - 3804	2818 (3)
Chlorophyll- uncorrected (µg/L)	3 - 11	5 (3)
Secchi (ft)	4.0 - 6.5	4.8 (3)
Secchi (m)	1.2 - 2.0	1.4 (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	Polk
Name	Patrick
GNIS Number	285465
Latitude	27.7922
Longitude	-81.5129
Water Body Type	Lake
Surface Area (ha and acre)	159 ha or 393 acre
Period of Record (year)	1996 to 1999
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	10 (7 to 13)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2818 (2327 to 3804)



- 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 Pierce in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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					
<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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	26 - 83	43 (15)
Total Nitrogen (µg/L)	722 - 2585	1278 (15)
Chlorophyll- uncorrected (µg/L)	8 - 101	25 (15)
Secchi (ft)	1.4 - 4.9	3.0 (15)
Secchi (m)	0.4 - 1.5	0.9 (15)
Color (Pt-Co Units)	23 - 69	36 (7)
Specific Conductance (µS/cm@25 C)	94 - 146	123 (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	Polk
Name	Pierce
GNIS Number	288797
Latitude	27.9845
Longitude	-81.5366
Water Body Type	Lake
Surface Area (ha and acre)	1509 ha or 3729 acre
Period of Record (year)	1990 to 2011
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	43 (26 to 83)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1278 (722 to 2585)



- 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 Pierce 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,  $R^2 = 0.72$ , p = 0.00), total nitrogen (TN Increasing,  $R^2 = 0.45$ , p = 0.01), chlorophyll (CHL Increasing,  $R^2 = 0.52$ , p = 0.00) and Secchi depth (Secchi Decreasing,  $R^2 = 0.56$ , p = 0.00).



## Florida LAKEWATCH Report for Pollock in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	157 - 222	188 (6)
Total Nitrogen (µg/L)	1139 - 1541	1361 (6)
Chlorophyll- uncorrected (µg/L)	56 - 91	73 (6)
Secchi (ft)	1.9 - 2.1	2.0 (6)
Secchi (m)	0.6 - 0.6	0.6 (6)
Color (Pt-Co Units)	15 - 22	20 (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	Polk
Name	Pollock
GNIS Number	304721
Latitude	27.9863
Longitude	-81.9274
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2001 to 2006
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	188 (157 to 222)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1361 (1139 to 1541)



- 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 Pollock 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,  $R^2 = 0.49$ , p = 0.12), total nitrogen (TN No Trend,  $R^2 = 0.23$ , p = 0.34), chlorophyll (CHL No Trend,  $R^2 = 0.46$ , p = 0.14) and Secchi depth (Secchi No Trend,  $R^2 = 0.11$ , p = 0.52).



## Florida LAKEWATCH Report for Reedy in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	19 - 28	23 (22)
Total Nitrogen (µg/L)	998 - 2084	1406 (22)
Chlorophyll- uncorrected (µg/L)	12 - 50	26 (22)
Secchi (ft)	1.5 - 3.7	2.3 (22)
Secchi (m)	0.4 - 1.1	0.7 (22)
Color (Pt-Co Units)	11 - 25	16 (17)
Specific Conductance (µS/cm@25 C)	232 - 657	281 (11)
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	Polk
Name	Reedy
GNIS Number	307559
Latitude	27.7452
Longitude	-81.5154
Water Body Type	Lake
Surface Area (ha and acre)	1411 ha or 3486 acre
Period of Record (year)	1996 to 2017
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	23 (19 to 28)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1406 (998 to 2084)



- 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 Reedy 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,  $R^2 = 0.09$ , p = 0.17), total nitrogen (TN Increasing,  $R^2 = 0.36$ , p = 0.00), chlorophyll (CHL No Trend,  $R^2 = 0.13$ , p = 0.10) and Secchi depth (Secchi Decreasing,  $R^2 = 0.23$ , p = 0.02).



## Florida LAKEWATCH Report for Ring in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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)	47 - 355	95 (3)
Total Nitrogen (µg/L)	1314 - 1823	1478 (3)
Chlorophyll- uncorrected ( $\mu$ g/L)	17 - 42	24 (3)
Secchi (ft)	1.7 - 3.7	2.6 (3)
Secchi (m)	0.5 - 1.1	0.8 (3)
Color (Pt-Co Units)	104 - 104	104 (1)
Specific Conductance (µS/cm@25 C)	-	(0)
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	Polk
Name	Ring
GNIS Number	289710
Latitude	28.0091
Longitude	-81.7023
Water Body Type	Lake
Surface Area (ha and acre)	1 ha or 3 acre
Period of Record (year)	1996 to 2005
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	95 (47 to 355)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1478 (1314 to 1823)



- 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 River in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 - 18	13 (6)
Total Nitrogen (µg/L)	661 - 867	777 (6)
Chlorophyll- uncorrected (µg/L)	3 - 5	4 (6)
Secchi (ft)	4.9 - 6.2	5.4 (6)
Secchi (m)	1.5 - 1.9	1.6 (6)
Color (Pt-Co Units)	35 - 47	42 (6)
Specific Conductance (µS/cm@25 C)	161 - 188	172 (5)
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	Polk
Name	River
GNIS Number	289728
Latitude	27.9833
Longitude	-81.6693
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2007 to 2012
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	13 (10 to 18)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	777 (661 to 867)



- 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 River 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 = 0.75), total nitrogen (TN No Trend,  $R^2 = 0.28$ , p = 0.28), chlorophyll (CHL No Trend,  $R^2 = 0.28$ , p = 0.28) and Secchi depth (Secchi No Trend,  $R^2 = 0.44$ , p = 0.15).



## Florida LAKEWATCH Report for Rochelle in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	41 - 176	70 (10)
Total Nitrogen (µg/L)	830 - 1313	1062 (10)
Chlorophyll- uncorrected (µg/L)	22 - 41	33 (10)
Secchi (ft)	2.4 - 3.2	2.7 (9)
Secchi (m)	0.7 - 1.0	0.8 (9)
Color (Pt-Co Units)	33 - 57	44 (2)
Specific Conductance (µS/cm@25 C)	-	(0)
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	Polk
Name	Rochelle
GNIS Number	289806
Latitude	28.0739
Longitude	-81.7274
Water Body Type	Lake
Surface Area (ha and acre)	242 ha or 598 acre
Period of Record (year)	1990 to 2004
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	70 (41 to 176)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1062 (830 to 1313)



- 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 Rochelle 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 Decreasing,  $R^2 = 0.64$ , p = 0.01), total nitrogen (TN No Trend,  $R^2 = 0.07$ , p = 0.46), chlorophyll (CHL No Trend,  $R^2 = 0.10$ , p = 0.38) and Secchi depth (Secchi No Trend,  $R^2 = 0.09$ , p = 0.42).



## Florida LAKEWATCH Report for Rosalie in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	n's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	27 - 51	33 (7)
Total Nitrogen (µg/L)	521 - 844	651 (7)
Chlorophyll- uncorrected (µg/L)	4 - 8	5 (7)
Secchi (ft)	3.2 - 5.1	4.1 (7)
Secchi (m)	1.0 - 1.6	1.3 (7)
Color (Pt-Co Units)	19 - 51	30 (3)
Specific Conductance (µS/cm@25 C)	83 - 153	112 (2)
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	Polk
Name	Rosalie
GNIS Number	289953
Latitude	27.9463
Longitude	-81.4159
Water Body Type	Lake
Surface Area (ha and acre)	1860 ha or 4597 acre
Period of Record (year)	1997 to 2008
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	33 (27 to 51)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	651 (521 to 844)



- 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 Rosalie 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,  $R^2 = 0.10$ , p = 0.50), total nitrogen (TN No Trend,  $R^2 = 0.09$ , p = 0.50), chlorophyll (CHL No Trend,  $R^2 = 0.11$ , p = 0.46) and Secchi depth (Secchi No Trend,  $R^2 = 0.30$ , p = 0.20).


#### Florida LAKEWATCH Report for Roy in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	21 - 21	21 (1)	
Total Nitrogen (µg/L)	776 - 776	776 (1)	
Chlorophyll- uncorrected (µg/L)	14 - 14	14 (1)	
Secchi (ft)	5.3 - 5.3	5.3 (1)	
Secchi (m)	1.6 - 1.6	1.6 (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	Polk
Name	Roy
GNIS Number	290023
Latitude	28.0035
Longitude	-81.7057
Water Body Type	Lake
Surface Area (ha and acre)	32 ha or 78 acre
Period of Record (year)	1995 to 1995
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	21 (21 to 21)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	776 (776 to 776)



- 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 Ruby in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	12 - 20	16 (5)	
Total Nitrogen (µg/L)	656 - 1047	782 (5)	
Chlorophyll- uncorrected (µg/L)	7 - 17	12 (5)	
Secchi (ft)	4.8 - 8.6	6.2 (5)	
Secchi (m)	1.5 - 2.6	1.9 (5)	
Color (Pt-Co Units)	8 - 13	10 (4)	
Specific Conductance (µS/cm@25 C)	269 - 280	275 (2)	
Lake Classification	Clear Hardwater		

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	Polk
Name	Ruby
GNIS Number	290047
Latitude	27.9749
Longitude	-81.6607
Water Body Type	Lake
Surface Area (ha and acre)	103 ha or 255 acre
Period of Record (year)	2004 to 2008
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	16 (12 to 20)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	782 (656 to 1047)



- 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 Ruby 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 Decreasing,  $R^2 = 0.99$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.79$ , p = 0.04), chlorophyll (CHL No Trend,  $R^2 = 0.73$ , p = 0.07) and Secchi depth (Secchi Increasing,  $R^2 = 0.79$ , p = 0.04).



#### Florida LAKEWATCH Report for Saddlebag in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	10 - 12	11 (2)
Total Nitrogen (µg/L)	598 - 651	624 (2)
Chlorophyll- uncorrected (µg/L)	2 - 4	3 (2)
Secchi (ft)	9.3 - 11.4	10.3 (2)
Secchi (m)	2.8 - 3.5	3.1 (2)
Color (Pt-Co Units)	11 - 13	12 (2)
Specific Conductance (µS/cm@25 C)	158 - 164	161 (2)
Lake Classification	Clear Hardwater	

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	Polk
Name	Saddlebag
GNIS Number	
Latitude	27.8912
Longitude	-81.4702
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2021 to 2022
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	11 (10 to 12)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	624 (598 to 651)



- 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 Scott in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	58 - 107	84 (4)	
Total Nitrogen (µg/L)	1423 - 1999	1748 (4)	
Chlorophyll- uncorrected (µg/L)	57 - 93	75 (4)	
Secchi (ft)	2.0 - 2.5	2.2 (4)	
Secchi (m)	0.6 - 0.8	0.7 (4)	
Color (Pt-Co Units)	21 - 22	21 (4)	
Specific Conductance (µS/cm@25 C)	183 - 208	191 (4)	
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	Polk
Name	Scott
GNIS Number	290763
Latitude	27.9682
Longitude	-81.9441
Water Body Type	Lake
Surface Area (ha and acre)	115.4 ha or 285 acre
Period of Record (year)	2018 to 2021
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration ( $\mu$ g/L, min. and max.)	84 (58 to 107)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1748 (1423 to 1999)



- 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 Shipp in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	26 - 75	41 (20)	
Total Nitrogen (µg/L)	1067 - 2462	1492 (20)	
Chlorophyll- uncorrected (µg/L)	28 - 98	49 (20)	
Secchi (ft)	1.2 - 3.4	2.1 (20)	
Secchi (m)	0.4 - 1.0	0.6 (20)	
Color (Pt-Co Units)	15 - 34	21 (15)	
Specific Conductance (µS/cm@25 C)	179 - 264	213 (11)	
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	Polk
Name	Shipp
GNIS Number	291058
Latitude	28.0005
Longitude	-81.7422
Water Body Type	Lake
Surface Area (ha and acre)	115 ha or 283 acre
Period of Record (year)	1991 to 2022
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	41 (26 to 75)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1492 (1067 to 2462)



- 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 Shipp 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 Decreasing,  $R^2 = 0.49$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.25$ , p = 0.02), chlorophyll (CHL Decreasing,  $R^2 = 0.55$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.43$ , p = 0.00).



#### Florida LAKEWATCH Report for Silver in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 in	terpretation
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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	15 - 24	20 (7)
Total Nitrogen (µg/L)	501 - 897	697 (7)
Chlorophyll- uncorrected (µg/L)	9 - 26	16 (7)
Secchi (ft)	3.3 - 7.4	4.9 (7)
Secchi (m)	1.0 - 2.2	1.5 (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	Polk
Name	Silver
GNIS Number	291141
Latitude	28.0304
Longitude	-81.7285
Water Body Type	Lake
Surface Area (ha and acre)	21 ha or 52 acre
Period of Record (year)	1991 to 2000
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	20 (15 to 24)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	697 (501 to 897)



- 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 Silver 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,  $R^2 = 0.55$ , p = 0.06), total nitrogen (TN No Trend,  $R^2 = 0.06$ , p = 0.59), chlorophyll (CHL No Trend,  $R^2 = 0.01$ , p = 0.80) and Secchi depth (Secchi No Trend,  $R^2 = 0.17$ , p = 0.36).



#### Florida LAKEWATCH Report for Smart in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	54 - 149	104 (3)
Total Nitrogen (µg/L)	1675 - 1778	1742 (3)
Chlorophyll- uncorrected (µg/L)	64 - 74	<b>69 (3)</b>
Secchi (ft)	2.2 - 2.4	2.3 (3)
Secchi (m)	0.7 - 0.7	0.7 (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	Polk
Name	Smart
GNIS Number	291238
Latitude	28.0633
Longitude	-81.7153
Water Body Type	Lake
Surface Area (ha and acre)	111 ha or 275 acre
Period of Record (year)	1991 to 1995
Lake Trophic Status (CHL)	Hypereutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	104 (54 to 149)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1742 (1675 to 1778)



- 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 Spirit in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	22 - 34	26 (15)	
Total Nitrogen (µg/L)	507 - 863	677 (15)	
Chlorophyll- uncorrected (µg/L)	13 - 28	19 (15)	
Secchi (ft)	4.4 - 8.7	5.5 (15)	
Secchi (m)	1.3 - 2.7	1.7 (15)	
Color (Pt-Co Units)	9 - 14	11 (9)	
Specific Conductance (µS/cm@25 C)	218 - 251	234 (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	Polk
Name	Spirit
GNIS Number	291503
Latitude	28.0009
Longitude	-81.7759
Water Body Type	Lake
Surface Area (ha and acre)	91 ha or 224 acre
Period of Record (year)	1991 to 2009
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	26 (22 to 34)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	677 (507 to 863)



- 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 Spirit 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,  $R^2 = 0.05$ , p = 0.43), total nitrogen (TN No Trend,  $R^2 = 0.20$ , p = 0.10), chlorophyll (CHL No Trend,  $R^2 = 0.02$ , p = 0.63) and Secchi depth (Secchi Increasing,  $R^2 = 0.27$ , p = 0.05).


#### Florida LAKEWATCH Report for Spring in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	18 - 31	24 (6)
Total Nitrogen (µg/L)	635 - 715	670 (6)
Chlorophyll- uncorrected (µg/L)	10 - 22	14 (6)
Secchi (ft)	5.0 - 7.2	6.0 (6)
Secchi (m)	1.5 - 2.2	1.8 (6)
Color (Pt-Co Units)	14 - 22	18 (4)
Specific Conductance (µS/cm@25 C)	174 - 180	178 (4)
Lake Classification	Clear Hardwater	

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	Polk
Name	Spring
GNIS Number	291545
Latitude	28.0373
Longitude	-81.7347
Water Body Type	Lake
Surface Area (ha and acre)	10 ha or 25 acre
Period of Record (year)	1991 to 2018
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	24 (18 to 31)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	670 (635 to 715)



- 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,  $R^2 = 0.55$ , p = 0.09), total nitrogen (TN No Trend,  $R^2 = 0.63$ , p = 0.06), chlorophyll (CHL No Trend,  $R^2 = 0.03$ , p = 0.75) and Secchi depth (Secchi No Trend,  $R^2 = 0.01$ , p = 0.85).



#### Florida LAKEWATCH Report for St. Anne in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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					
<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)	10 - 10	10 (1)
Total Nitrogen (µg/L)	2606 - 2606	2606 (1)
Chlorophyll- uncorrected (µg/L)	4 - 4	4 (1)
Secchi (ft)	13.3 - 13.3	13.3 (1)
Secchi (m)	4.1 - 4.1	4.1 (1)
Color (Pt-Co Units)	5 - 5	5 (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	Polk
Name	St. Anne
GNIS Number	290145
Latitude	27.8789
Longitude	-81.4874
Water Body Type	Lake
Surface Area (ha and acre)	6 ha or 15 acre
Period of Record (year)	2006 to 2006
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	10 (10 to 10)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	2606 (2606 to 2606)



- 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 Starr in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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 Environmen	tal Protection	ı's Numeric	Nutrient	Criteria	for lakes.
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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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	11 - 17	14 (6)
Total Nitrogen (µg/L)	536 - 637	592 (6)
Chlorophyll- uncorrected (µg/L)	3 - 7	5 (6)
Secchi (ft)	7.6 - 13.1	10.2 (6)
Secchi (m)	2.3 - 4.0	3.1 (6)
Color (Pt-Co Units)	6 - 9	8 (4)
Specific Conductance (µS/cm@25 C)	182 - 208	197 (4)
Lake Classification	Clear Hardwater	

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	Polk
Name	Starr
GNIS Number	291639
Latitude	27.9585
Longitude	-81.5818
Water Body Type	Lake
Surface Area (ha and acre)	49.79 ha or 123 acre
Period of Record (year)	2006 to 2011
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (11 to 17)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	592 (536 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 Starr 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,  $R^2 = 0.38$ , p = 0.19), total nitrogen (TN No Trend,  $R^2 = 0.09$ , p = 0.56), chlorophyll (CHL Decreasing,  $R^2 = 0.71$ , p = 0.03) and Secchi depth (Secchi No Trend,  $R^2 = 0.22$ , p = 0.35).



#### Florida LAKEWATCH Report for Summit in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	15 - 36	21 (10)
Total Nitrogen (µg/L)	682 - 945	781 (10)
Chlorophyll- uncorrected (µg/L)	6 - 26	12 (10)
Secchi (ft)	3.1 - 8.3	5.4 (10)
Secchi (m)	1.0 - 2.5	1.7 (10)
Color (Pt-Co Units)	10 - 15	12 (8)
Specific Conductance (µS/cm@25 C)	232 - 303	271 (8)
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	Polk
Name	Summit
GNIS Number	291809
Latitude	27.9976
Longitude	-81.6952
Water Body Type	Lake
Surface Area (ha and acre)	28 ha or 68 acre
Period of Record (year)	1991 to 2015
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	21 (15 to 36)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	781 (682 to 945)



- 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 Summit 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 Decreasing,  $R^2 = 0.80$ , p = 0.00), total nitrogen (TN Decreasing,  $R^2 = 0.73$ , p = 0.00), chlorophyll (CHL Decreasing,  $R^2 = 0.83$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.70$ , p = 0.00).



#### Florida LAKEWATCH Report for Symphony in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	76 - 76	76 (1)
Total Nitrogen (µg/L)	690 - 690	<b>690 (1)</b>
Chlorophyll- uncorrected (µg/L)	13 - 13	13 (1)
Secchi (ft)	6.9 - 6.9	6.9 (1)
Secchi (m)	2.1 - 2.1	2.1 (1)
Color (Pt-Co Units)	27 - 27	27 (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	Polk
Name	Symphony
GNIS Number	
Latitude	28.0025
Longitude	-82.0251
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	2003 to 2003
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP6
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	76 (76 to 76)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	690 (690 to 690)



- 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 Tracy in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	14 - 21	17 (2)
Total Nitrogen (µg/L)	489 - 750	606 (2)
Chlorophyll- uncorrected (µg/L)	3 - 6	4 (2)
Secchi (ft)	6.3 - 6.3	6.3 (1)
Secchi (m)	1.9 - 1.9	1.9 (1)
Color (Pt-Co Units)	16 - 16	16 (1)
Specific Conductance (µS/cm@25 C)	136 - 136	136 (1)
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	Polk
Name	Tracy
GNIS Number	292392
Latitude	28.1087
Longitude	-81.6335
Water Body Type	Lake
Surface Area (ha and acre)	55 ha or 136 acre
Period of Record (year)	2007 to 2008
Lake Trophic Status (CHL)	Mesotrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	17 (14 to 21)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	606 (489 to 750)



- 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 Wales in Polk 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> **vears 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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	Grand Geometric Mean
	Annual Geometric Means	(Sampling years)
Total Phosphorus (µg/L)	22 - 36	27 (17)
Total Nitrogen (µg/L)	626 - 1515	1009 (17)
Chlorophyll- uncorrected (µg/L)	14 - 48	30 (17)
Secchi (ft)	1.5 - 5.1	2.4 (17)
Secchi (m)	0.5 - 1.6	0.7 (17)
Color (Pt-Co Units)	11 - 19	15 (14)
Specific Conductance (µS/cm@25 C)	95 - 147	133 (9)
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 (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	Polk
Name	Wales
GNIS Number	292828
Latitude	27.9013
Longitude	-81.5774
Water Body Type	Lake
Surface Area (ha and acre)	132 ha or 326 acre
Period of Record (year)	1990 to 2015
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP3
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	27 (22 to 36)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	1009 (626 to 1515)



- 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 Wales 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,  $R^2 = 0.16$ , p = 0.11), total nitrogen (TN Increasing,  $R^2 = 0.27$ , p = 0.03), chlorophyll (CHL No Trend,  $R^2 = 0.16$ , p = 0.11) and Secchi depth (Secchi Decreasing,  $R^2 = 0.34$ , p = 0.01).



#### Florida LAKEWATCH Report for Weohyakapka in Polk 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 (µS/cm@25°C): Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolved materials in water.
- Lake Classification: Numeric nutrient criteria for Florida require that lakes must first be classified into one of three group based on color and alkalinity or specific conductance; colored lakes (color greater than 40 Pt-Co units), clear soft water lakes (color less than or equal to 40 Pt-Co units and alkalinity less than or equal to 20 mg/L as 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)	17 - 45	28 (30)
Total Nitrogen (µg/L)	516 - 1199	815 (30)
Chlorophyll- uncorrected ( $\mu$ g/L)	4 - 35	14 (30)
Secchi (ft)	1.7 - 7.1	3.2 (30)
Secchi (m)	0.5 - 2.2	1.0 (30)
Color (Pt-Co Units)	25 - 81	41 (21)
Specific Conductance (µS/cm@25 C)	84 - 137	111 (15)
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 (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	Polk
Name	Weohyakapka
GNIS Number	294192
Latitude	27.8061
Longitude	-81.4202
Water Body Type	Lake
Surface Area (ha and acre)	2964 ha or 7325 acre
Period of Record (year)	1992 to 2022
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP5
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	28 (17 to 45)
TN Zone	TN5
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	815 (516 to 1199)



- 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 Weohyakapka 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,  $R^2 = 0.61$ , p = 0.00), total nitrogen (TN Increasing,  $R^2 = 0.36$ , p = 0.00), chlorophyll (CHL Increasing,  $R^2 = 0.39$ , p = 0.00) and Secchi depth (Secchi Decreasing,  $R^2 = 0.75$ , p = 0.00).



#### Florida LAKEWATCH Report for Whistler in Polk 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.

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

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

<sup>1</sup> For lakes with color > 40 PCU in the West Central Nutrient Watershed Region, the maximum TP limit shall be the 490  $\mu$ g/L TP streams threshold for the region.

For the purpose of subparagraph 62-302.531(2)(b)1., F.A.C., color shall be assessed as true color and shall be free from turbidity. Lake color and alkalinity shall be the long-term geometric mean, based on a minimum of ten data points over at least three years with at least one data point in each year. If insufficient alkalinity data are available, long-term geometric mean specific conductance values shall be used, with a value of <100  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

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

Parameter	Minimum and Maximum	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	19 - 22	20 (7)	
Total Nitrogen (µg/L)	597 - 916	762 (7)	
Chlorophyll- uncorrected (µg/L)	7 - 24	15 (7)	
Secchi (ft)	3.5 - 7.0	4.8 (7)	
Secchi (m)	1.1 - 2.1	1.5 (7)	
Color (Pt-Co Units)	12 - 19	15 (7)	
Specific Conductance (µS/cm@25 C)	223 - 262	237 (7)	
Lake Classification	Clear Hardwater		

#### Base File Data for Lakes: Definitions and Nutrient Zone Maps

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	Polk
Name	Whistler
GNIS Number	293192
Latitude	28.0882
Longitude	-81.8119
Water Body Type	Lake
Surface Area (ha and acre)	31 ha or 76 acre
Period of Record (year)	2016 to 2022
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	20 (19 to 22)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	762 (597 to 916)



Figure 1. Maps showing Florida phosphorus and nitrogen zones and the nutrient concentrations of the upper 90% of lakes within each zone (Bachmann et al. 2012). Explanation on how to interpret the Nutrient Zones on page 4.

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

- 1. Identify your lake's *Lake Classification* in Table 2 (Colored, Clear Hard Water, or Clear Soft Water) (if no classification is listed then there is not enough data available to classify your lake).
  - a. The *Lake Classification* tells you which row to use in Table 1.
- 2. Identify your waterbody's Grand Geometric Mean Chlorophyll-uncorrected in Table 2.
  - a. Compare this number to the Annual Geometric Mean Chlorophyll-corrected (2<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.

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

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

Figure 2. Lake Whistler 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 = 0.67), total nitrogen (TN Decreasing,  $R^2 = 0.69$ , p = 0.02), chlorophyll (CHL Decreasing,  $R^2 = 0.94$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.89$ , p = 0.00).



#### Florida LAKEWATCH Report for Winterset in Polk 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> **vears 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.

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

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

<sup>1</sup> For lakes with color > 40 PCU in the West Central Nutrient Watershed Region, the maximum TP limit shall be the 490  $\mu$ g/L TP streams threshold for the region.

For the purpose of subparagraph 62-302.531(2)(b)1., F.A.C., color shall be assessed as true color and shall be free from turbidity. Lake color and alkalinity shall be the long-term geometric mean, based on a minimum of ten data points over at least three years with at least one data point in each year. If insufficient alkalinity data are available, long-term geometric mean specific conductance values shall be used, with a value of <100  $\mu$ S/cm@25 C used to estimate the mg/L CaCO<sub>3</sub> alkalinity concentration until such time that alkalinity data are available.

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

Parameter	Minimum and Maximum	Grand Geometric Mean	
	Annual Geometric Means	(Sampling years)	
Total Phosphorus (µg/L)	10 - 18	14 (10)	
Total Nitrogen (µg/L)	555 - 732	629 (10)	
Chlorophyll- uncorrected (µg/L)	5 - 16	8 (9)	
Secchi (ft)	4.1 - 12.6	7.9 (9)	
Secchi (m)	1.3 - 3.8	2.4 (9)	
Color (Pt-Co Units)	6 - 10	8 (8)	
Specific Conductance (µS/cm@25 C)	190 - 273	249 (8)	
Lake Classification	Clear Hardwater		

#### Base File Data for Lakes: Definitions and Nutrient Zone Maps

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	Polk
Name	Winterset
GNIS Number	293430
Latitude	27.9697
Longitude	-81.6807
Water Body Type	Lake
Surface Area (ha and acre)	. ha or . acre
Period of Record (year)	1997 to 2017
Lake Trophic Status (CHL)	Eutrophic
TP Zone	TP4
Grand TP Geometric Mean Concentration (µg/L, min. and max.)	14 (10 to 18)
TN Zone	TN4
Grand TN Geometric Mean Concentration (µg/L, min. and max.)	629 (555 to 732)



Figure 1. Maps showing Florida phosphorus and nitrogen zones and the nutrient concentrations of the upper 90% of lakes within each zone (Bachmann et al. 2012). Explanation on how to interpret the Nutrient Zones on page 4.

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

- 1. Identify your lake's *Lake Classification* in Table 2 (Colored, Clear Hard Water, or Clear Soft Water) (if no classification is listed then there is not enough data available to classify your lake).
  - a. The *Lake Classification* tells you which row to use in Table 1.
- 2. Identify your waterbody's Grand Geometric Mean Chlorophyll-uncorrected in Table 2.
  - a. Compare this number to the Annual Geometric Mean Chlorophyll-corrected (2<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.

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

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

Figure 2. Lake Winterset 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,  $R^2 = 0.07$ , p = 0.44), total nitrogen (TN No Trend,  $R^2 = 0.20$ , p = 0.20), chlorophyll (CHL Decreasing,  $R^2 = 0.80$ , p = 0.00) and Secchi depth (Secchi Increasing,  $R^2 = 0.73$ , p = 0.00).

