



LAKES & STORMWATER
407 FAIRWAY AVENUE
LAKELAND, FLORIDA 33801
863.834.3300

Surface Water Quality Monitoring Report 2021-Second Quarter Update



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Glossary

Chlorophyll *a*

A green pigment found in plants and blue-green algae and an essential component in the process of converting light energy into chemical energy. Chlorophyll *a* in water samples are a useful indicator of phytoplankton biomass, especially when used in conjunction with analysis concerning algal growth potential and species abundance. Chlorophyll *a* corrected (chlorophyll *a* corr) refers to the method corrected for pheophytin.

Color

True color of water is determined by measuring a filtered sample against platinum cobalt units (PCU) color standard; the resulting color is caused by dissolved substances. Apparent color can be a factor of the natural decomposition of organic matter that is dissolved in the water and suspended matter in the water column.

Dissolved Oxygen (DO)

The amount of oxygen dissolved in water, an essential component of the aquatic environment.

Florida Department of Environmental Protection (FDEP)

The Florida Department of Environmental Protection is the state's lead agency for environmental management and stewardship.

Numeric Nutrient Criteria (NNC)

Numeric nutrient criteria are quantitative expressions of water quality management goals. The lakes criteria were based on a stressor-response relationship between total nitrogen and total phosphorus (TN and TP) and phytoplankton response (chlorophyll *a*).

Total Nitrogen (TN)

A measure of all the forms of nitrogen, including inorganic and organic.

Total Phosphorous (TP)

Includes inorganic and organic types of phosphorous.

Total Maximum Daily Load (TMDL)

The FDEP designates a TMDL as the scientific determination of the maximum amount of a given pollutant that a surface water can absorb and still meet the water quality standards that protect human health and aquatic life.

Quality Assurance (QA)

As defined in the Florida Administrative Code 62-160.120, an integrated system of management activities involving planning, implementation, documentation, assessment, reporting and quality improvement to ensure that a process, product or service meets defined standards of quality.

Quality Assurance/Quality Control (QA/QC)

The process or set of processes used to measure and assure the quality of a product or procedure (QA), and the related activities and processes of verifying products and deliverables are of acceptable quality that meet the established data quality objectives.

List of Abbreviations

Units of Measurement		Standard deviation of associated units by parameter	
Parameter	Unit of Measurement		
Temperature (°C)	Celsius (C°)		
pH (std unit)	Standard unit		
Conductivity (uS)	Microsiemens (uS)		
Dissolved Oxygen (mg/L)	Milligrams per Liter (mg/L)		
Turbidity (NTU)	Nephelometric Turbidity Unit (NTU)		
Secchi Depth (m)	Meter (m)		
Total Alkalinity (mg/L)	Milligrams per Liter (mg/L)		
Total Ammonia (mg/L)	Milligrams per Liter (mg/L)		
Total Kjeldahl Nitrogen (mg/L)	Milligrams per Liter (mg/L)		
Nitrate-Nitrite (mg/L)	Milligrams per Liter (mg/L)		
Total Nitrogen (mg/L)	Milligrams per Liter (mg/L)		
Total Phosphorus (mg/L)	Milligrams per Liter (mg/L)		
Ortho Phosphorus (mg/L)	Milligrams per Liter (mg/L)		
Chlorophyll <i>a</i> , corrected (ug/L)	Micrograms per Liter (ug/L)		
Color (Pt-Co)	Platinum-cobalt Scale		
Total Suspended Solids (mg/L)	Milligrams per Liter (mg/L)		

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Introduction

The City of Lakeland's Lakes and Stormwater Division, along with the Polk County Department of Natural Resources, monitors 15 lakes within the boundary of the City's stormwater drainage influence. In this report, quarterly water quality monitoring results are summarized and compared to the Florida Department of Environmental Protection (FDEP) Numeric Nutrient Criteria (NNC) standards set forth by the Florida Administrative Code 62-302.531. Numeric nutrient criteria are quantitative expressions of water quality management goals. The lakes criteria were based on a stressor-response relationship between total nitrogen and total phosphorus (TN and TP) and phytoplankton response chlorophyll *a*. These quarterly results are a small component of a much larger data set which can be significant in documenting and evaluating water quality trends. This document provides the latest results from the second quarter of 2021 and includes ten-year trend analysis for each monitored lake. For the purposes of this report, total nitrogen (TN), total phosphorous (TP), and chlorophyll *a* results are compared to the NNC to evaluate compliance with the state water quality standards.

Background

The sampling of Lakeland's lakes is a coordinated effort between the City of Lakeland (the City) and Polk County's Department of Natural Resources (the County). The current monitoring programs include the collection and analysis of water samples collected from one sampling station near the center of each of the fifteen monitored lakes on a quarterly basis. The City monitors Lakes Beulah, Bonnet, Horney, Mirror, Morton, and Wire, while the County monitors Lakes Bonny, Crago, Crystal, Gibson, Hollingsworth, Hunter, John, Parker, and Somerset. The samples are collected per the methods defined in the Surface Water Sampling Standard Operating Procedure of the Florida Department of Environmental Protection (FDEP) for Bioassessment activities (SOP FS 2100). During each sampling event, field data is recorded with a Sonde and direct grab samples are collected at the sampling station in the center of each monitored lake. The samples for nutrient analyses are preserved with sulfuric acid. All samples are placed in a cooler upon collection and stored on ice until transported to the laboratory for analysis. At the conclusion of the sampling activities, samples are transported under a properly recorded chain of custody form and delivered to the Polk County Natural Resources Lab (PCNRL) for analysis.

The FDEP NNC was implemented in 2013 to determine nutrient impairment for lakes based on the concentrations of chlorophyll *a*, TN and/or TP. Each lake must be characterized as a low (color ≤40 PCU) or high color (color > 40 PCU) lake. Low color lakes are further classified as acidic (alkalinity ≤ 20 mg/L) or alkaline (alkalinity > 20 mg/L). The appropriate NNC criteria are assigned based upon the characterization and chlorophyll *a* concentration on an annual basis (Figure 2-2). The criteria are compared to the annual geometric mean of each parameter.

Long Term Geometric Mean Lake Color and Alkalinity	Annual Geometric Mean Chlorophyll <i>a</i>	Minimum calculated numeric interpretation		Maximum calculated numeric interpretation	
		Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen	Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen
> 40 Platinum Cobalt Units	20 µg/L	0.05 mg/L	1.27 mg/L	0.16 mg/L ¹	2.23 mg/L
≤ 40 Platinum Cobalt Units and > 20 mg/L CaCO ₃	20 µg/L	0.03 mg/L	1.05 mg/L	0.09 mg/L	1.91 mg/L
≤ 40 Platinum Cobalt Units and ≤ 20 mg/L CaCO ₃	6 µg/L	0.01 mg/L	0.51 mg/L	0.03 mg/L	0.93 mg/L

Table -1.Lake NNC chlorophyll *a*, TN and TP criteria (from FDEP 2013)

FDEP allows for an acceptable range of annual geometric means of TN and TP, up to the values shown in the “maximum calculated numeric interpretation” column, as long as the applicable chlorophyll *a* criterion is achieved in that same year. These numeric interpretations for TN, TP, and chlorophyll *a* can’t be exceeded more than once in any consecutive three-year period.

If there is insufficient data to calculate the annual geometric mean for chlorophyll *a* for any given year, or the annual geometric mean for chlorophyll *a* exceeds the values based on color and alkalinity, then the applicable NNC interpretations for TN and TP are the minimum calculated values. If there are sufficient data to calculate the chlorophyll *a* annual geometric mean and the mean does not exceed the chlorophyll *a* values for the lake type, then the NNC interpretation is the annual geometric means of ambient TN and TP or the maximum calculated limits in the table. More than one exceedance (for any parameter) in any three-year period is required for a waterbody to be declared impaired using NNC. Also, for lakes with color values greater than 40 PCU in FDEP’s “West Central Nutrient Watershed Region” (a region that includes all of the City of Lakeland), the allowable maximum TP limit increases to 0.49 mg/L, if chlorophyll *a* concentrations are below 20 µg/L.

The lakes in Lakeland are low color lakes (≤ 40 PCU), have greater than the alkalinity value (≥ 20 mg/L CaCO_3), and most exceed the chlorophyll *a* value (20 $\mu\text{g/L}$). Currently, for *Lakes Bonnet, Crago, Gibson, Horney, Hunter, John, Mirror, Morton, Parker, and Somerset*, the threshold for nutrients is the minimum calculated numeric interpretation and is as follows:

Parameter	Numeric Nutrient Criterion
Chlorophyll <i>a</i>	20 $\mu\text{g/L}$
Total Nitrogen	1.05 mg/L
Total Phosphorous	0.03 mg/L

Lake Wire and *Lake Beulah* do not exceed the chlorophyll *a* criteria of 20 $\mu\text{g/L}$, therefore, the current threshold for nutrients is the maximum calculated numeric interpretation and is as follows:

Parameter	Numeric Nutrient Criterion
Chlorophyll <i>a</i>	20 $\mu\text{g/L}$
Total Nitrogen	1.91 mg/L
Total Phosphorous	0.09 mg/L

Some lakes have site specific NNC as stated in the FDEP's Final Report for the Total Maximum Daily Loads (TMDLs). For *Lakes Bonny, Crystal, and Hollingsworth*, the threshold for nutrients are as follows:

Lake Bonny has site specific NNC based on the Final TMDL Report dated September 2016. The site-specific criterion for Lake Bonny are as follows:

Parameter	Numeric Nutrient Criterion
Chlorophyll <i>a</i>	20 $\mu\text{g/L}$
Total Nitrogen	0.89 mg/L
Total Phosphorous	0.04 mg/L

Crystal Lake has site specific NNC based on the Final TMDL Report dated March 2018. The site-specific criterion for Crystal Lake are as follows:

Parameter	Numeric Nutrient Criterion
Chlorophyll <i>a</i>	20 $\mu\text{g/L}$
Total Nitrogen	0.89 mg/L
Total Phosphorous	0.03 mg/L

Lake Hollingsworth has site specific NNC based on the Final TMDL Report dated November 2017. The site-specific criterion for Lake Hollingsworth are as follows:

Parameter	Numeric Nutrient Criterion
Chlorophyll <i>a</i>	20 $\mu\text{g/L}$
Total Nitrogen	0.86 mg/L
Total Phosphorous	0.03 mg/L

Surface Water Sampling and Analysis Procedures

On June 8, 2021, field sampling personnel from the City conducted quarterly surface water monitoring activities at the following lakes: Beulah, Bonnet, Horney, Mirror, Morton, and Wire. Water quality parameters were measured in the field with a portable Sonde which included temperature, pH, conductivity, and dissolved oxygen. A secchi disk was used to measure water clarity. Representative surface water samples were then collected and preserved according to the FDEP Standard Operating Procedures (SOP) for General Water Sampling (DEP FS 2000) and Surface Water Sampling (FS 2100). The samples were obtained by the direct grab method within the top 12 inches of water using sampling bottles approved for the analytes of interest. Samples were transported under a properly recorded Chain of Custody form and delivered to the County's laboratory for analysis. The analyzed parameters include the following: turbidity, total alkalinity, total ammonia, total Kjeldahl nitrogen, nitrate-nitrite, total nitrogen, total phosphorous, ortho-phosphorous, chlorophyll *a*, color, and total suspended solids. On June 1, 2021, personnel from the County collected surface water samples from Hollingsworth, Hunter, John, and Somerset. On June 8, personnel from the County collected a sample from Bonny, Crago, Gibson, and Parker. On June 14, personnel from the County collected surface water samples from Crystal. The County uses similar sample collection and handling procedures as those employed by the City. The County's samples were transported under proper chain of custody to the PCNRL for analysis of the above listed parameters.

Surface Water Quality Data

Quarterly water quality monitoring results for samples collected by the City and the County are summarized in the following data tables. Additionally, a summary of the previous ten years of nutrient monitoring data as compared to the NNC are provided to illustrate longer term trends in temporal water quality trends. Lakes Bonnet, Bonny, Crago, Crystal, Gibson, Hollingsworth, Horney, Hunter, John, Mirror, Morton, Parker, and Somerset exceeded the NNC for TN, TP, and chlorophyll *a* during the June 2021 quarterly monitoring event. Lakes Beulah and Wire did not exceed the NNC for TN, TP, or chlorophyll *a*.

The laboratory analytical results are used to calculate the annual geometric mean for TN, TP and chlorophyll *a* per the NNC interpretation discussed above for low color lakes with alkalinity higher than 20 mg/L.

Additionally, any Quality Assurance/Quality Control (QA/QC) issues are reviewed and reported accordingly. For this sampling event, the pre-trip verification was not completed by new staff in training. Therefore, all field data for each station sampled by the City (Beulah, Bonnet, Horney, Mirror, Morton and Wire) has been qualified with "J" followed by this explanation and is documented on the lab report.

Lake Beulah

Surface Water Quality Result Data

Field Measurements

Parameter (unit)	6/8/2021
Temperature (°C)	29.0
pH (std unit)	8.67
Conductivity (uS)	124.3
Dissolved Oxygen (mg/L)	8.79
Secchi Depth (m)	0.95

Table 2. Field Measurements for Lake Beulah.

Analytical Results

Parameter (unit)	6/8/2021
Turbidity (NTU)	1.9
Total Alkalinity (mg/L)	51.4
Total Ammonia (mg/L)	0.019
Total Kjeldahl Nitrogen (mg/L)	1.11
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	7
Total Suspended Solids (mg/L)	2.4

Table 3. Analytical Results for Lake Beulah

Lake Beulah Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
Current Applicable NNC <i>(Minimum/Maximum TN/TP Calculated Interpretation of Annual Geometric Mean)</i>	1.05 1.91	0.03 0.09	20
9/6/11	2.792	0.031	22.4
12/7/11	1.022	0.029	10.4
1/4/12	0.703	0.036	10.4
4/2/12	1.673	0.039	13.6
7/10/12	0.555	0.03	3.0
10/8/12	0.467	0.041	12.8
1/8/13	0.638	0.053	19.20
4/2/13	0.131	0.075	52.90
10/2/13	1.269	0.032	35.20
1/7/14	0.67	0.035	12.00
4/2/14	0.630	0.043	6.42
7/1/14	NS	NS	NS
10/1/14	NS	NS	NS
3/1/15	NS	NS	NS
6/1/15	NS	NS	NS
9/1/15	NS	NS	NS
12/1/15	NS	NS	NS
1/1/16	NS	NS	NS
4/1/16	NS	NS	NS
7/1/16	NS	NS	NS
10/1/16	NS	NS	NS
1/1/17	NS	NS	NS
4/1/17	NS	NS	NS
7/19/17	0.78	0.026	3.00
11/8/17	0.820	0.037	16.00
3/6/18	0.82	0.037	13.6
6/5/18	0.65	0.029	13.6
9/11/18	0.67	0.031	7.21
12/4/18	1.18	0.053	57.7
1/9/19	0.940	0.054	37.6
4/23/19	0.770	0.028	6.4
7/9/19	0.540	0.027	10.4
10/23/19*	1.730	0.069	76.1
2/12/20*	1.710	0.058	47.3
5/27/20	0.970	0.046	12.8
8/19/20	1.130	0.059	14.4
11/17/20*	1.110	0.061	26.4
3/16/21	0.940	0.046	11.6
6/8/21	1.11	0.046	4.41

Table 4. NS=Not Sampled; * = s the minimum calculated numeric interpretation was used to determine the applicable NNC for the samples collected based on elevated chlorophyll *a* concentrations; **Red font** indicates quarterly result is at or exceeds applicable NNC; **Green font** indicates quarterly result is below applicable NNC

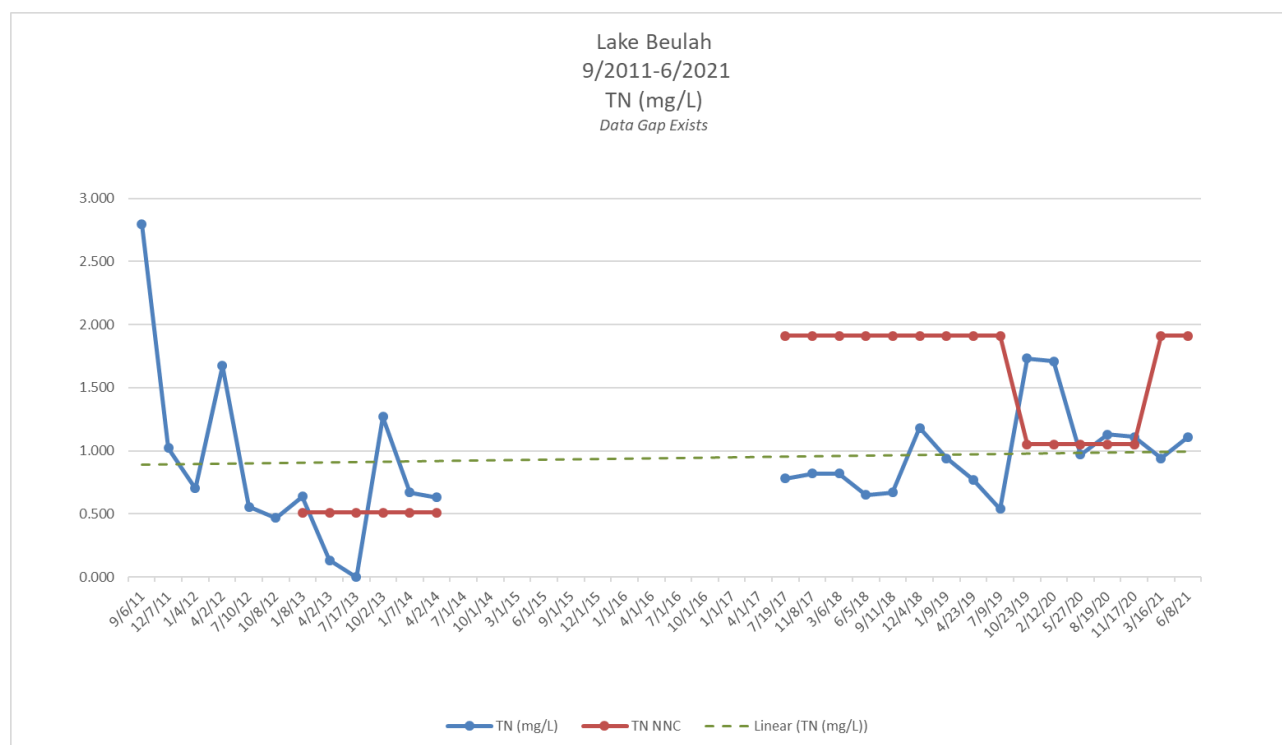


Figure 1. Total Nitrogen/Numeric Nutrient Criteria for Lake Beulah; The change in NNC thresholds are reflective of differences in alkalinity, chlorophyll *a* result and mean criteria.



Figure 2. Total Phosphorous/Numeric Nutrient Criteria for Lake Beulah; The change in NNC threshold is reflective of differences in alkalinity, chlorophyll *a* mean and result criteria

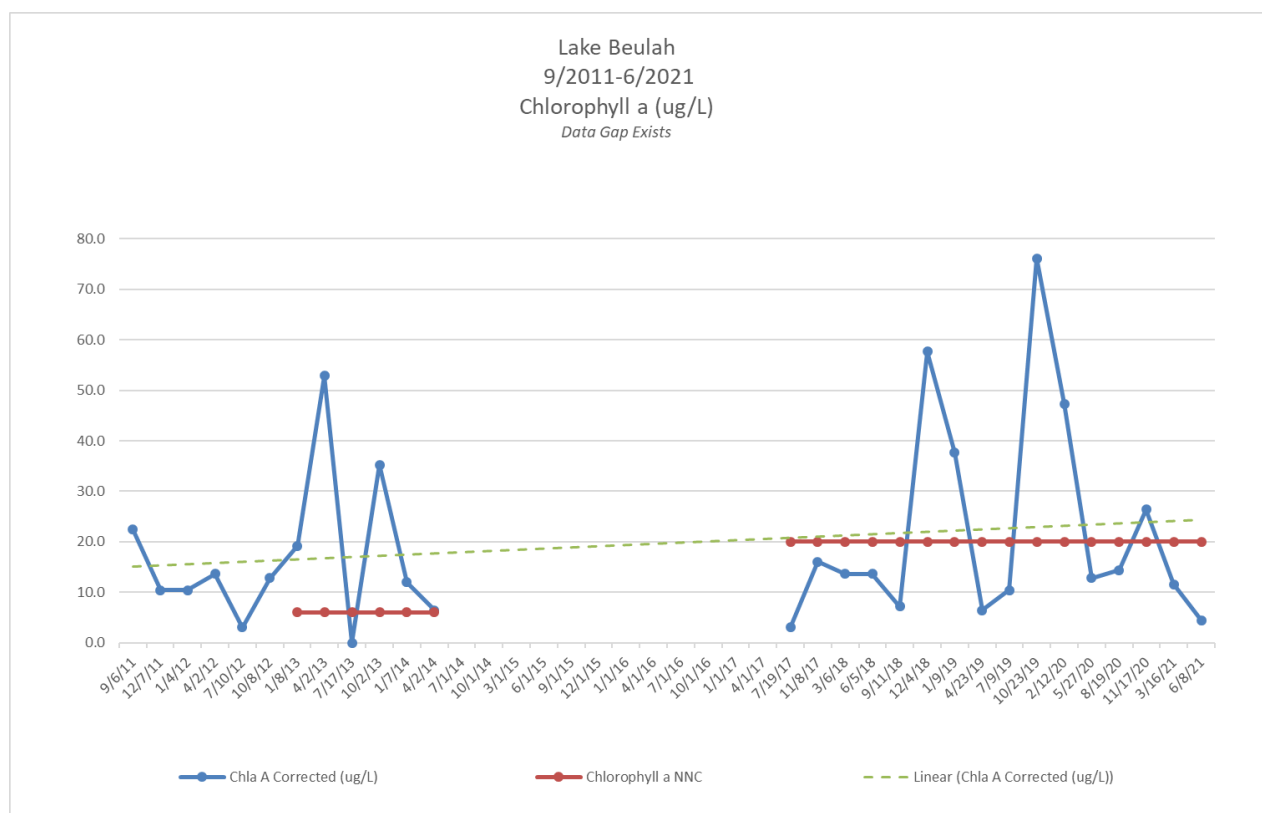


Figure 3. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Beulah; The change in NNC threshold is reflective of differences in alkalinity and chlorophyll *a* result criteria

Summary

The most recent water quality monitoring results for Lake Beulah are subject to the maximum NNC criteria because the chlorophyll *a* result did not exceed the value for lake type. TN, TP, and chlorophyll *a* concentrations are in compliance with the applicable NNC for this quarter. The trend for TN, TP and Chlorophyll *a* are increasing. The change in the NNC threshold as shown in Figures 1,2, and 3 is due to the differences in alkalinity and chlorophyll *a* result criteria. Due to the gap in data, the ten year trend is not comprehensive and cannot be considered as long term or trend setting until additional data is collected in the future and analyzed.

Lake Bonnet

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.4
pH (std unit)	9.34
Conductivity (uS)	201.2
Dissolved Oxygen (mg/L)	9.31
Secchi Depth (m)	0.10

Table 5. Field Measurements for Lake Bonnet

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	45
Total Alkalinity (mg/L)	74.9
Total Ammonia (mg/L)	0.032
Total Kjeldahl Nitrogen (mg/L)	9.39
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	25
Total Suspended Solids (mg/L)	43.5

Table 6. Analytical Results for Lake Bonnet

Lake Bonnet Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
Current Applicable NNC <i>(Minimum Calculated Numeric Interpretation of Annual Geometric Mean)</i>	1.05	0.03	20
9/6/11	3.512	0.273	96.1
12/7/11	4.165	0.182	120.0
1/4/12	5.215	0.25	108.0
4/2/12	7.875	0.459	252.0
7/10/12	2.7	0.148	104.0
10/8/12	2.688	0.209	75.1
1/8/13	2.823	0.235	104.0
4/2/13	3.159	0.236	64.1
7/1/13	NS	NS	NS
10/2/13	5.406	0.199	76.1
1/7/14	3.800	0.259	98.1
4/2/14	2.600	0.175	60.1
9/16/14	2.640	0.192	81.2
10/22/14	2.970	0.199	92.1
3/18/15	3.570	0.225	124.0
6/9/15	5.970	0.348	252.0
9/16/15	3.290	0.335	90.1
12/8/15	4.220	0.332	128.0
1/1/16	NS	NS	NS
4/1/16	NS	NS	NS
7/1/16	NS	NS	NS
10/10/16	2.84	0.234	96.1
1/18/17	3.59	0.272	90.1
4/18/17	3.71	0.252	116
7/19/17	3.90	0.280	120
11/8/17	2.750	0.186	71.0
3/6/18	4.01	0.296	264.0
6/5/18	2.06	0.183	74.1
9/11/18	3.40	0.266	128.0
12/4/18	3.180	0.236	108.0
1/9/19	1.920	0.162	50.1
4/23/19	3.620	0.249	104.0
7/9/19	0.850	0.062	158.0
10/23/19	2.060	0.214	83.3
2/12/20	1.960	0.180	41.4
5/27/20	4.740	0.250	171.0
8/19/20	2.420	0.204	96.1
11/17/20	2.520	0.328	76.1
3/16/21	3.67	0.297	148
6/8/21	9.39	0.481	637.0

Table 7. NS=Not Sampled; **Red font** indicates quarterly result is at or exceeds applicable NNC; **Green font** indicates quarterly result is below applicable NNC

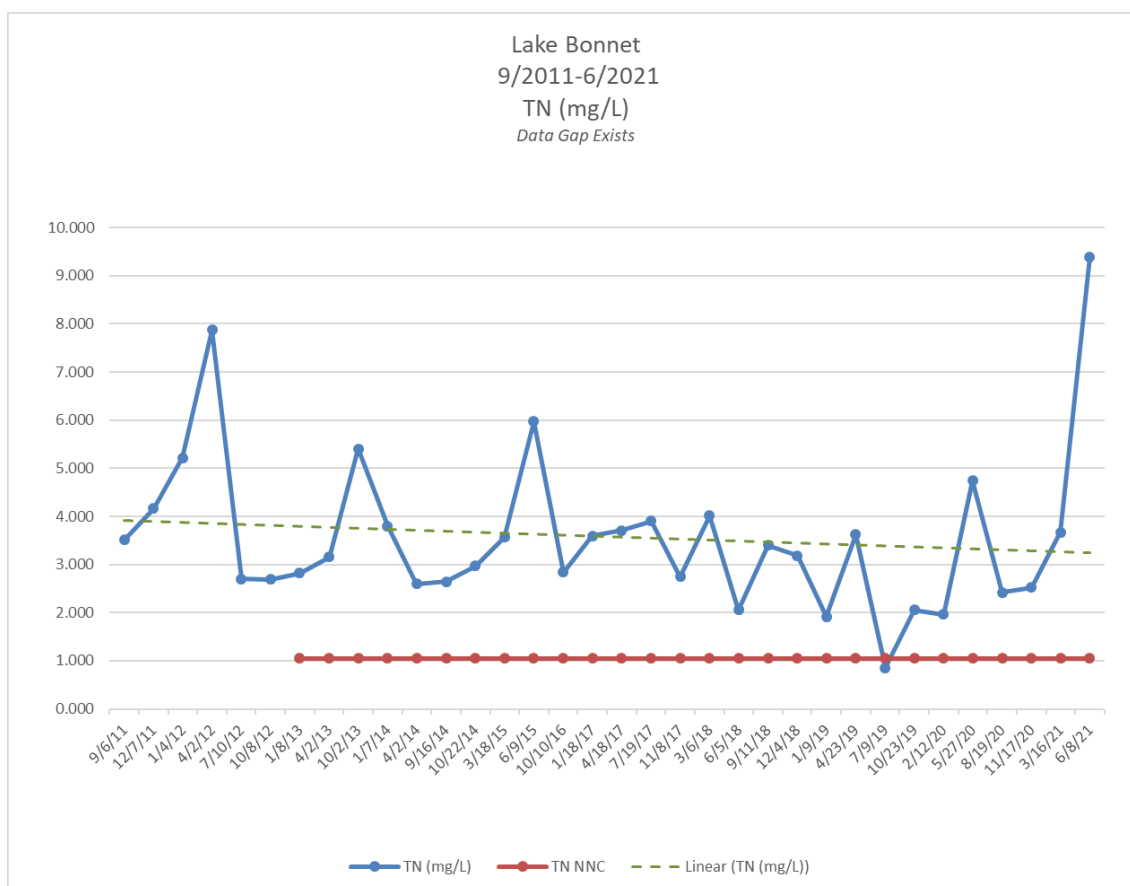


Figure 4. Total Nitrogen/Numeric Nutrient Criteria for Lake Bonnet

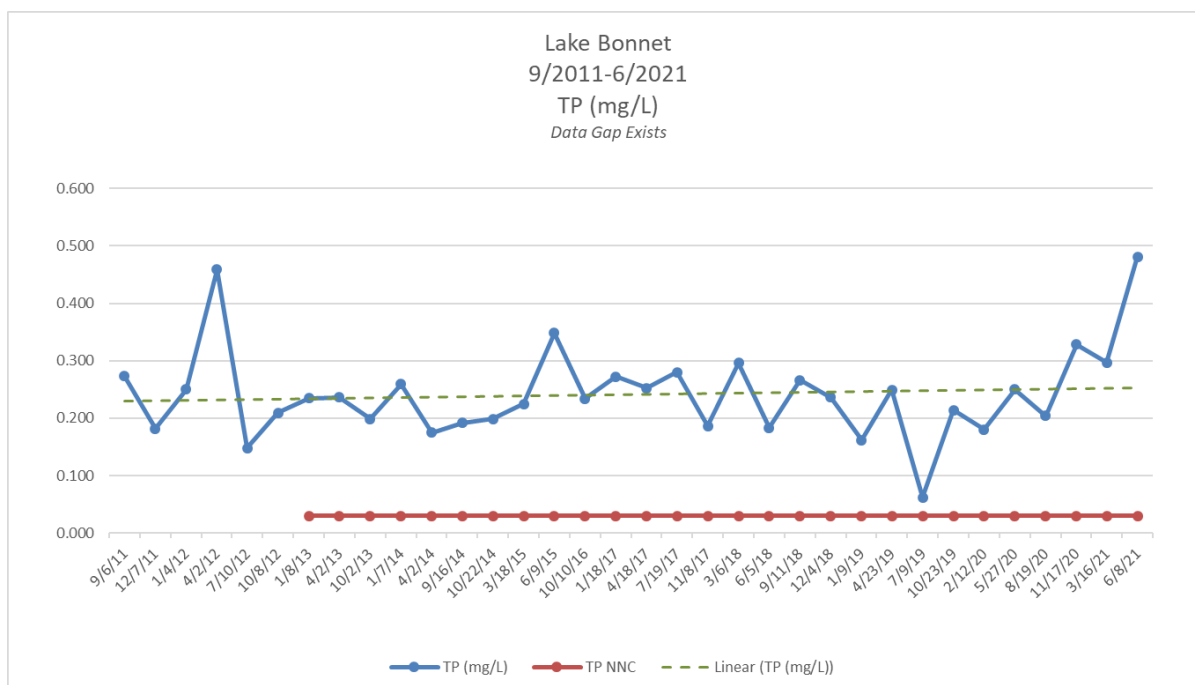


Figure 5. Total Phosphorous/Numeric Nutrient Criteria for Lake Bonnet

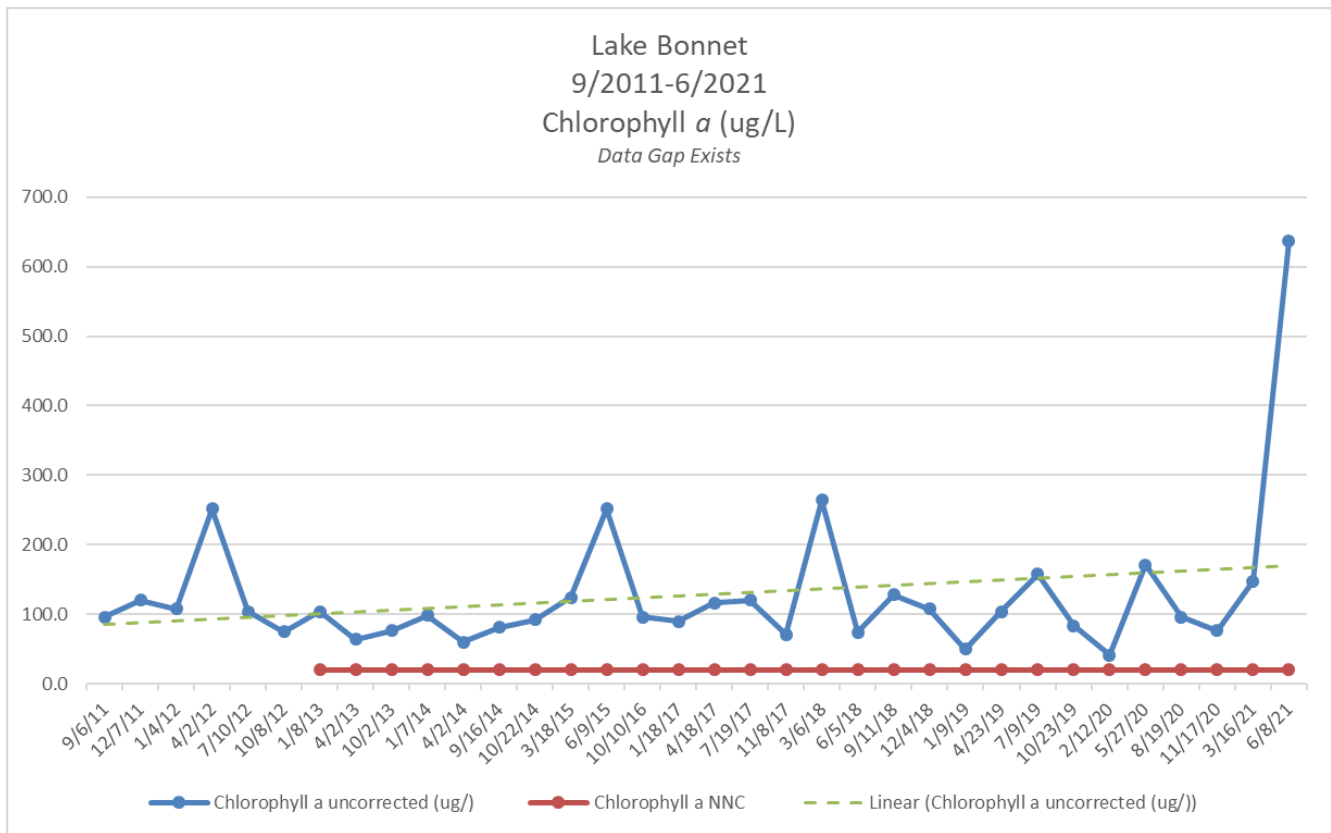


Figure 6. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Bonnet

Summary

Lake Bonnet water quality results for TN, TP, and chlorophyll *a* concentrations exceed the applicable NNC. The ten year trend shows that TN is decreasing, while TP and chlorophyll *a* concentrations are slightly increasing. For this quarter, there is a significant rise in TN, TP, and chlorophyll *a* concentrations.

Lake Bonny

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.5
pH (std unit)	8.13
Conductivity (uS)	135.5
Dissolved Oxygen (mg/L)	8.30
Secchi Depth (m)	0.40

Table 8. Field Measurements for Lake Bonny

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	10
Total Alkalinity (mg/L)	46.3
Total Ammonia (mg/L)	0.010
Total Kjeldahl Nitrogen (mg/L)	2.9
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	22
Total Suspended Solids (mg/L)	54

Table 9. Analytical Results for Lake Bonny

Lake Bonny Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (TMDL Report-Site Specific)</i>	0.89	0.04	20
9/7/11	4.818	0.084	82.1
12/5/11	2.253	0.097	60.1
2/1/12	2.285	0.092	42.0
5/2/12	3.049	0.108	50.7
8/7/12	2.509	0.066	45.4
11/7/12	1.565	0.072	37.4
1/17/13	1.63	0.07	29.4
2/4/13	1.923	0.085	34.0
4/11/13	2.07	0.089	48.1
7/17/13	2.08	0.075	46.4
10/8/13	1.570	0.074	35.4
2/4/14	1.720	0.060	28.0
5/13/14	2.520	0.066	55.1
8/12/14	1.830	0.047	43.0
11/19/14	1.950	0.065	34.0
3/3/15	1.490	0.046	24.0
6/11/15	1.90	0.060	47.1
9/17/15	1.43	0.043	38.8
12/10/15	1.30	0.047	30.0
1/19/16	1.16	0.039	16.8
4/11/16	1.29	0.044	20.8
7/12/16	1.37	0.033	36.8
10/13/16	1.67	0.053	50.9
2/15/17	1.160	0.055	18.4
5/10/17	2.05	0.094	42.1
8/7/17	1.39	0.082	32.4
11/14/17	1.84	0.079	60.1
3/12/18	1.92	0.082	48.1
6/13/18	1.67	0.072	36.0
9/4/18	2.23	0.081	93.5
12/10/18	2.54	0.140	84.1
1/15/19	2.14	0.151	70.1
4/10/19	2.17	0.117	96.1
7/8/19	2.08	0.079	68.1
10/10/19	2.04	0.137	59.1
2/17/20	1.74	0.091	49.1
5/12/20	2.80	0.142	96.1
8/11/20	1.620	0.048	37.1
11/5/20	1.860	0.089	42.7
3/2/21	1.520	0.062	29.4
6/8/21	2.90	0.120	64.1

Table 10. The applicable regulatory standard for Lake Bonnet is a site specific TMDL NNC; **Red font** indicates quarterly result is at or exceeds the site specific NNC; **Green font** indicates quarterly result is below the applicable site specific NNC

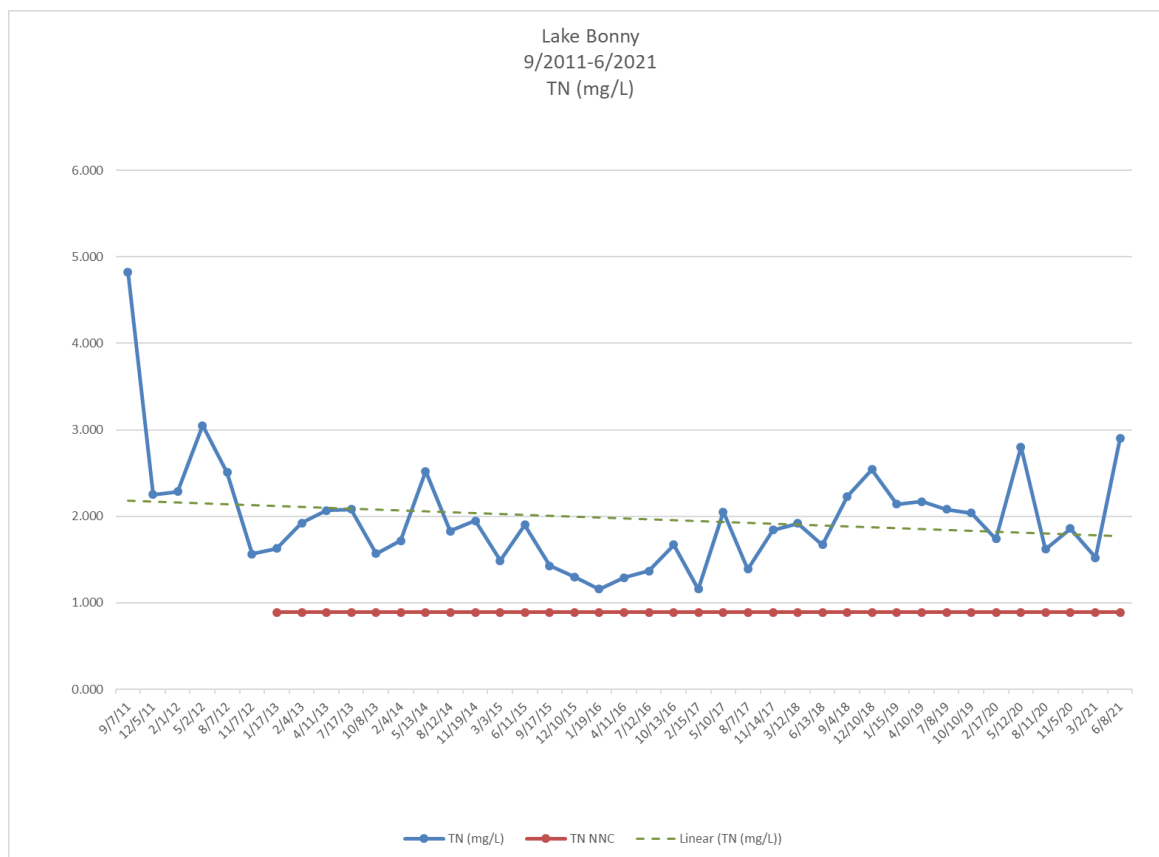


Figure 7. Total Nitrogen/Numeric Nutrient Criteria for Lake Bonny

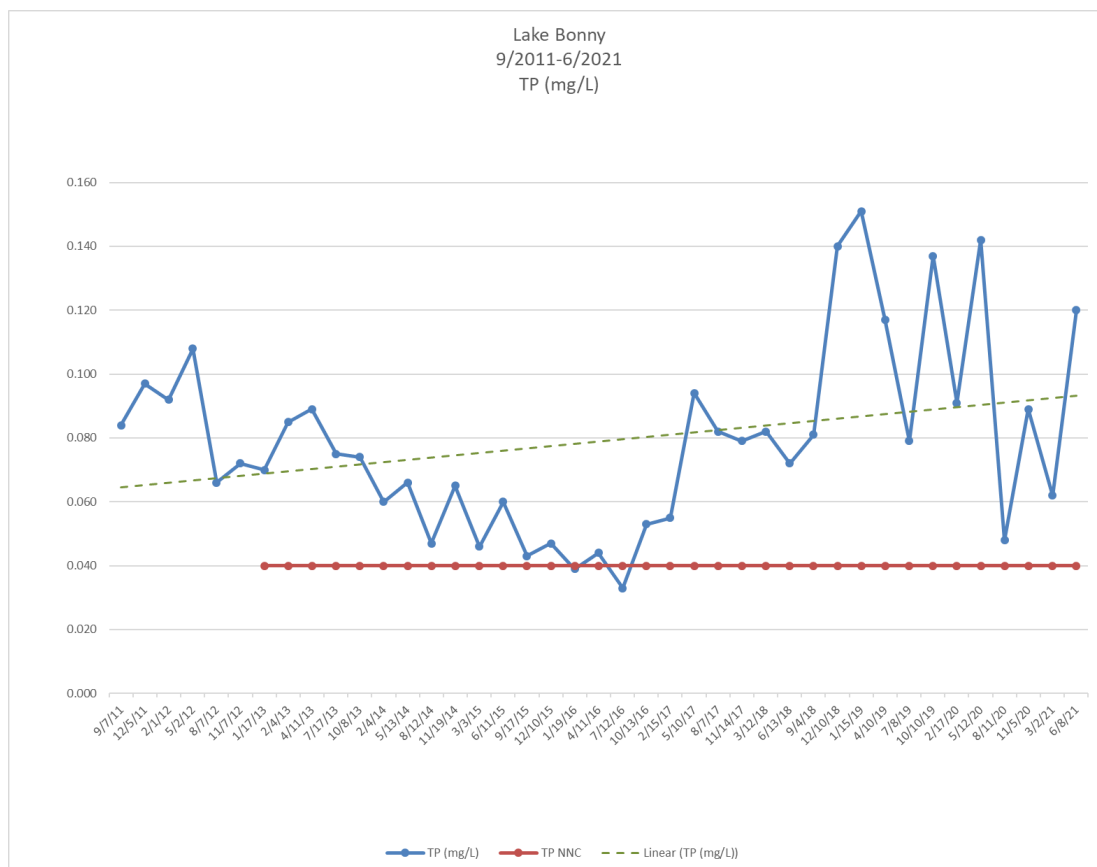


Figure 8. Total Phosphorous/Numeric Nutrient Criteria for Lake Bonny

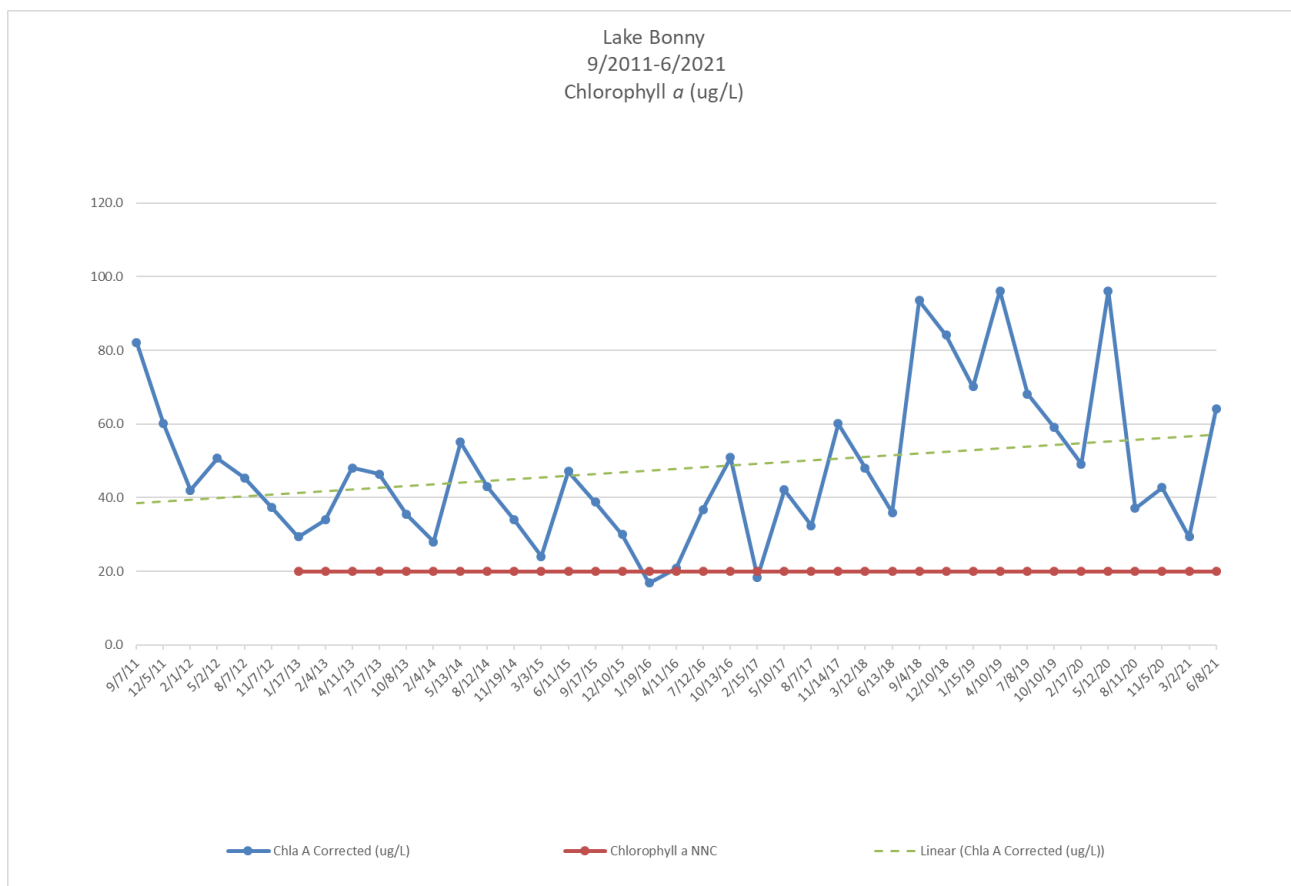


Figure 9. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Bonny

Summary

Water quality results for Lake Bonny indicate that TN, TP, and chlorophyll *a* exceed the applicable site specific NNC which is based on the 2016 TMDL report. The TN trend reflects a decrease while the trend for TP and chlorophyll *a* shows an increase over the last ten year period. It is important to note that between August 2014 and July 2016 there was a continual decrease in TP concentrations to the point of NNC compliance in July 2016. After July 2016, there has been an increase in TP concentrations.

Lake Crago

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.9
pH (std unit)	9.10
Conductivity (uS)	191.8
Dissolved Oxygen (mg/L)	8.21
Secchi Depth (m)	0.70

Table 11. Field Measurements for Lake Crago

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	7.5
Total Alkalinity (mg/L)	65.5
Total Ammonia (mg/L)	0.013
Total Kjeldahl Nitrogen (mg/L)	1.69
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	17
Total Suspended Solids (mg/L)	10.8

Table 12. Analytical Results for Lake Crago

Lake Crago Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation of Annual Geometric Mean)</i>	1.05	0.03	20
9/8/11	1.368	0.072	59.3
12/5/11	1.866	0.16	102.0
2/1/12	2.157	0.153	98.8
5/2/12	2.319	0.109	60.1
8/8/12	1.379	0.056	34.4
11/5/12	3.006	0.29	161.0
2/6/13	2.381	0.26	133.0
5/8/13	1.675	0.156	86.5
8/1/13	NS	NS	NS
11/20/13	2.477	0.236	133.0
1/8/14	2.950	0.284	81.2
5/13/14	1.930	0.103	81.7
8/12/14	1.350	0.069	48.1
11/18/14	2.940	0.241	92.5
3/2/15	2.050	0.227	118.0
6/3/15	1.930	0.096	48.1
9/10/15	1.830	0.140	80.1
12/9/15	2.750	0.220	121.0
1/19/16	3.180	0.272	98.5
4/6/16	2.380	0.190	108.0
7/12/16	1.350	0.074	38.9
10/13/16	1.540	0.110	66.5
2/14/17	3.060	0.391	239.0
5/15/17	2.690	0.293	148.0
8/9/17	1.420	0.135	48.1
11/1/17	3.740	0.407	189.0
3/12/18	2.260	0.206	145.0
6/13/18	1.990	0.149	90.1
9/10/18	1.29	0.099	61.7
12/13/18	3.900	0.315	136.0
1/8/19	2.310	0.220	174.0
4/10/19	2.070	0.149	92.1
7/8/19	1.030	0.075	48.1
10/10/19	1.480	0.083	50.5
2/13/20	1.370	0.138	162.0
5/12/20	1.780	0.145	64.1
8/11/20	0.870	0.034	39.3
11/5/20	2.380	0.189	42.5
3/2/21	1.960	0.143	60.1
6/8/21	1.69	0.101	32.8

Table 13. NS=Not Sampled; **Red font** indicates quarterly result is at or exceeds applicable NNC; **Green font** indicates quarterly result is below applicable NNC

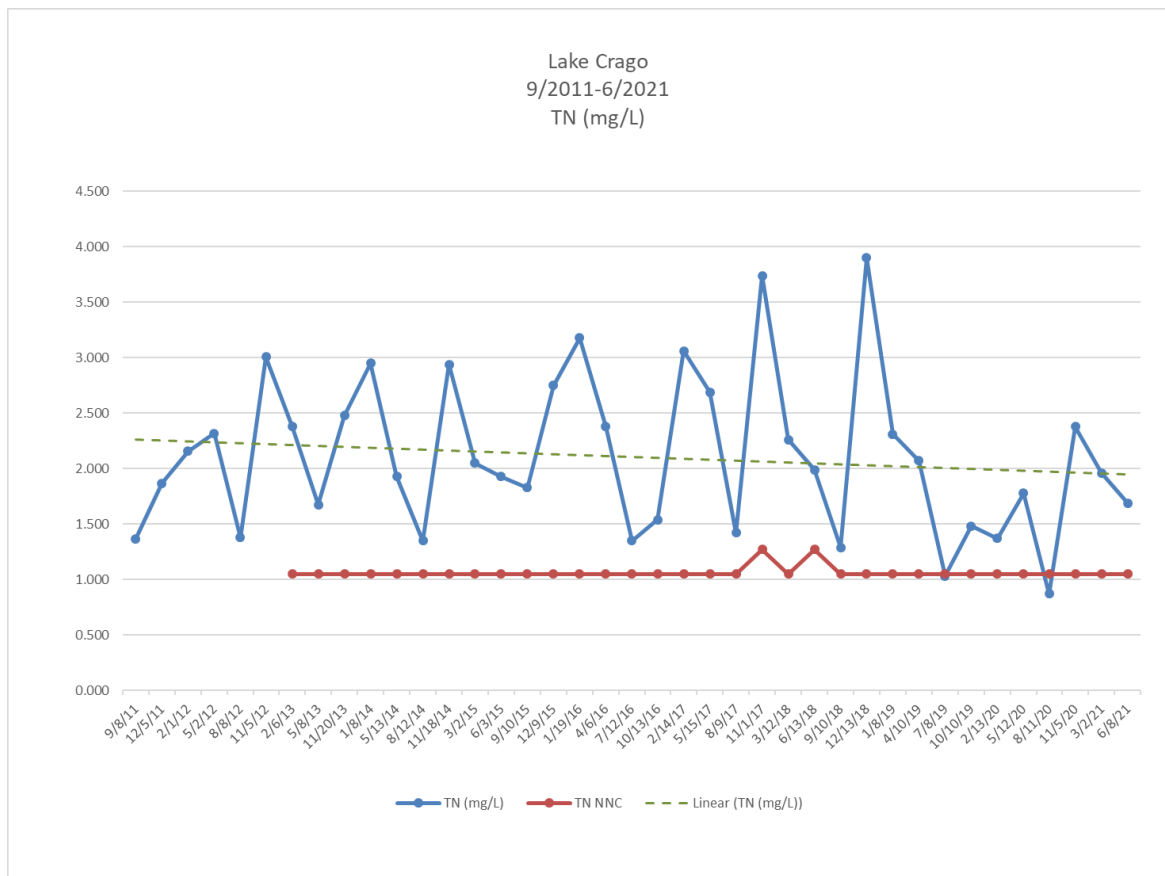


Figure 10. Total Nitrogen/Numeric Nutrient Criteria for Lake Crago

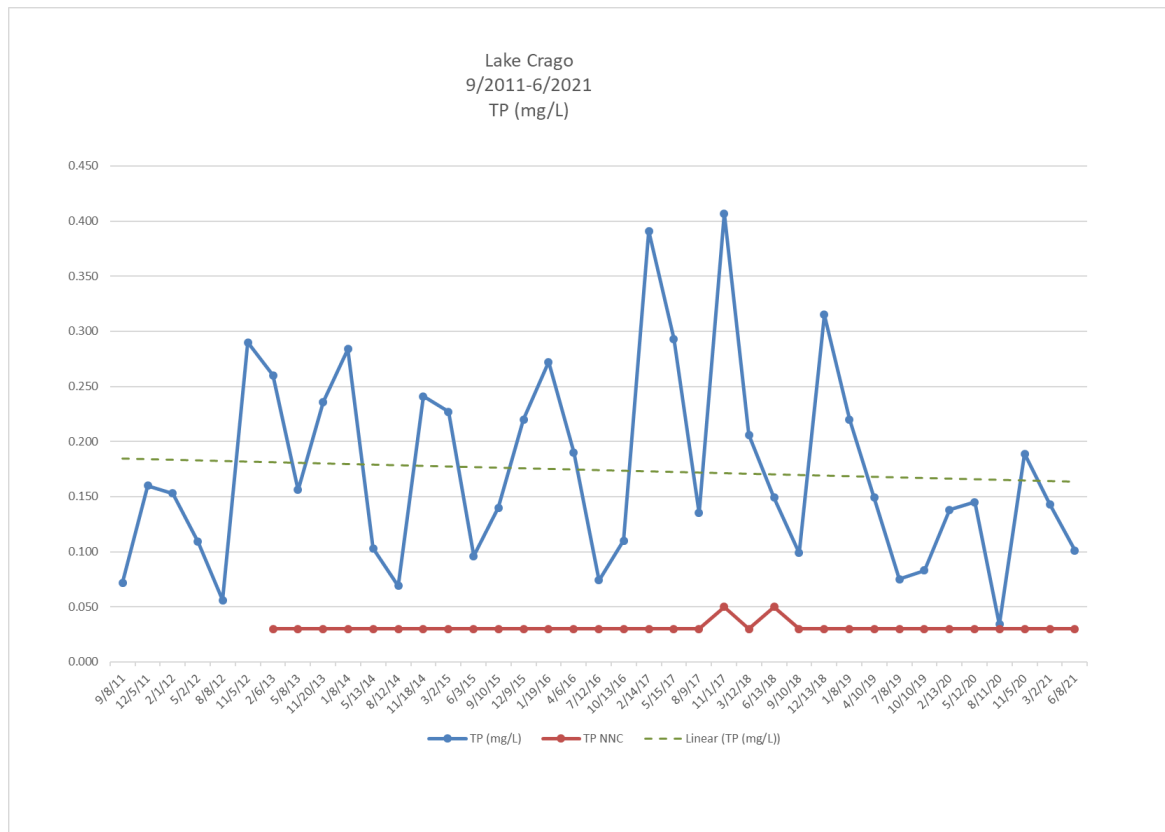


Figure 11. Total Phosphorous/Numeric Nutrient Criteria for Lake Crago

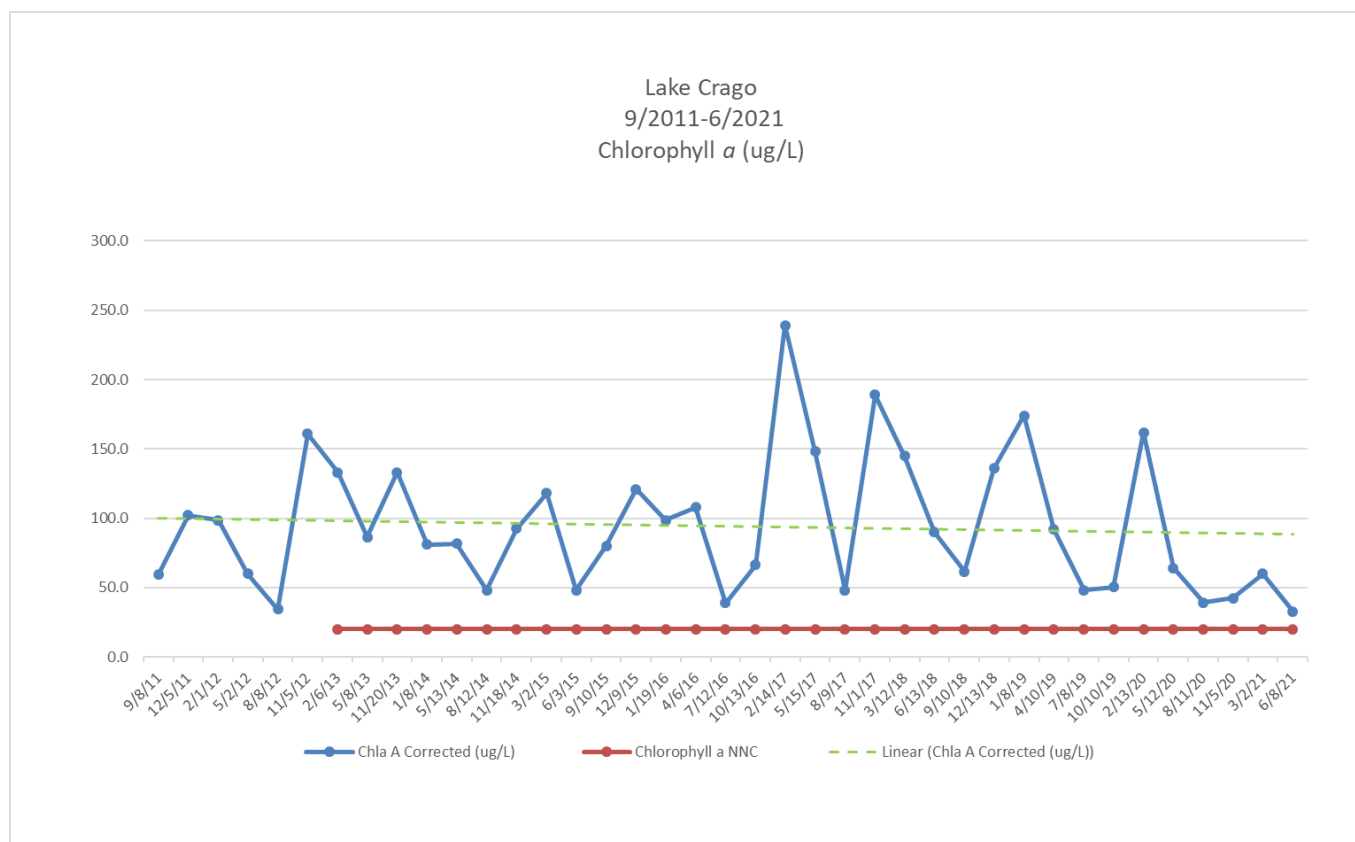


Figure 12. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Crago

Summary

Water quality monitoring results for Lake Crago show that TN, TP and chlorophyll *a* concentrations exceed the current applicable NNC. The trends for TN, TP and chlorophyll *a* reflect a decrease over the last ten year period. For TN and TP in 2017 and 2018, the change in NNC is due to the high color result which stipulates different numerical limits.

Crystal Lake

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/14/2021
Temperature (°C)	29.4
pH (std unit)	8.26
Conductivity (uS)	153.5
Dissolved Oxygen (mg/L)	7.50
Secchi Depth (m)	0.65

Table 14. Field Measurements for Crystal Lake

Analytical Results	
Parameter (unit)	6/14/2021
Turbidity (NTU)	4.6
Total Alkalinity (mg/L)	52.5
Total Ammonia (mg/L)	0.01
Total Kjeldahl Nitrogen (mg/L)	1.44
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	17
Total Suspended Solids (mg/L)	7.2

Table 15. Analytical Results for Crystal Lake

Crystal Lake Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (TMDL Report-Site Specific)</i>	0.89	0.03	20
8/18/11	1.98	0.081	63.3
11/9/11	1.6	0.082	55.3
3/7/12	1.84	0.095	67.1
6/14/12	1.98	0.139	54.1
9/18/12	2.01	0.269	82.6
12/11/12	2.15	0.357	84.1
1/17/13	1.58	0.287	63.3
4/15/13	2.34	0.154	121
7/17/13	2.12	0.108	68.1
10/14/13	2.71	0.263	118
2/12/14	2.93	0.25	120
5/8/14	3.76	0.229	204
8/12/14	1.79	0.086	57.7
11/19/14	2.66	0.184	85.7
3/3/15	1.44	0.092	37.1
6/11/15	1.32	0.079	56.5
9/15/15	1.10	0.073	32.4
12/10/15	1.24	0.082	50.0
1/19/16	1.14	0.079	29.2
4/6/16	1.04	0.053	25.8
7/6/16	1.08	0.046	19.2
10/12/16	0.98	0.075	38.5
2/15/17	1.38	0.080	39.2
5/15/17	1.50	0.072	35.2
8/14/17	0.99	0.049	20
11/13/17	1.39	0.075	56.5
3/15/18	1.22	0.067	33.6
6/18/18	1.06	0.038	17.6
9/10/18	1.17	0.055	44.3
12/13/18	1.57	0.068	58.7
1/8/19	1.32	0.062	48.1
4/4/19	1.29	0.056	33.6
7/9/19	0.95	0.033	30.4
10/9/19	1.18	0.061	43.3
2/6/20	1.22	0.072	28.0
5/14/20	1.20	0.051	21.6
8/13/20	1.05	0.043	22.4
11/18/20	1.22	0.068	36.0
3/11/21	1.33	0.165	36.8
6/14/21	1.44	0.065	28.8

Table 16. Current Max annual geometric mean based on FDEP TMDL Draft Report 3/2018; **Red shaded** indicates quarterly result is at or exceeds the site specific TMDL NNC; **Green font** indicates quarterly result is below applicable NNC

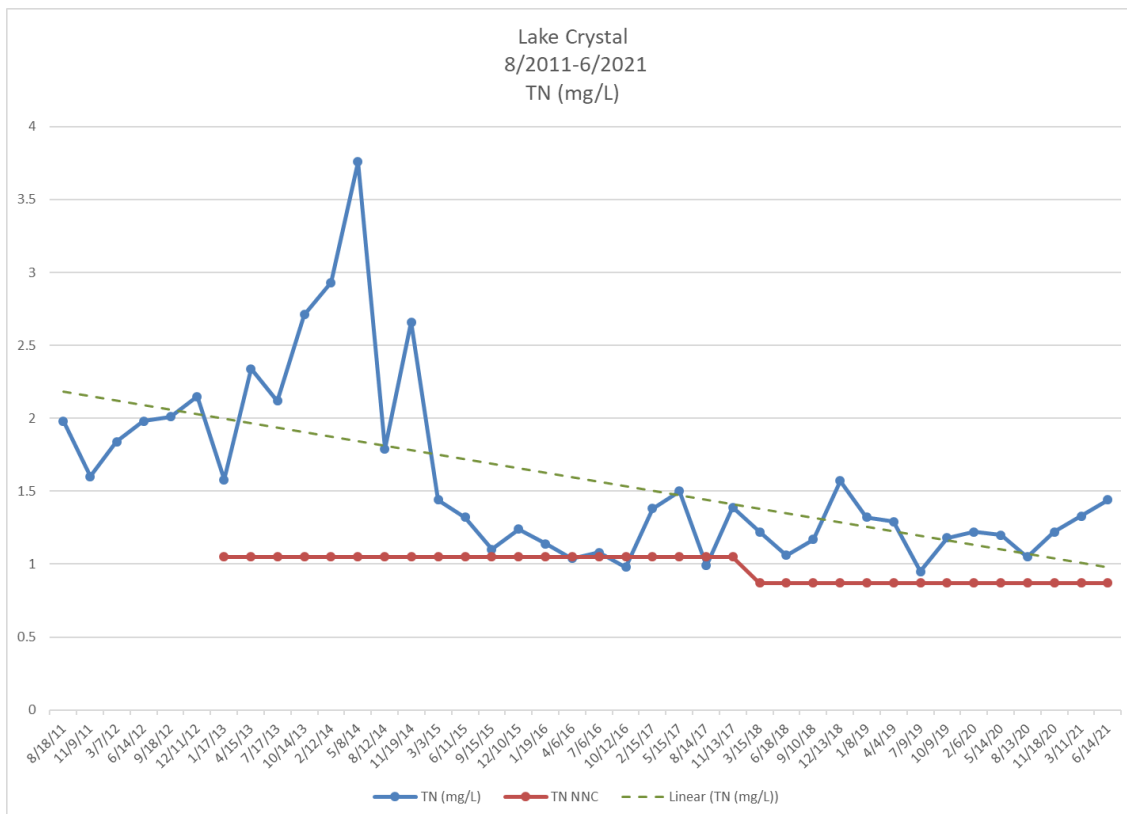


Figure 13. Total Nitrogen/Numeric Nutrient Criteria for Lake Crystal

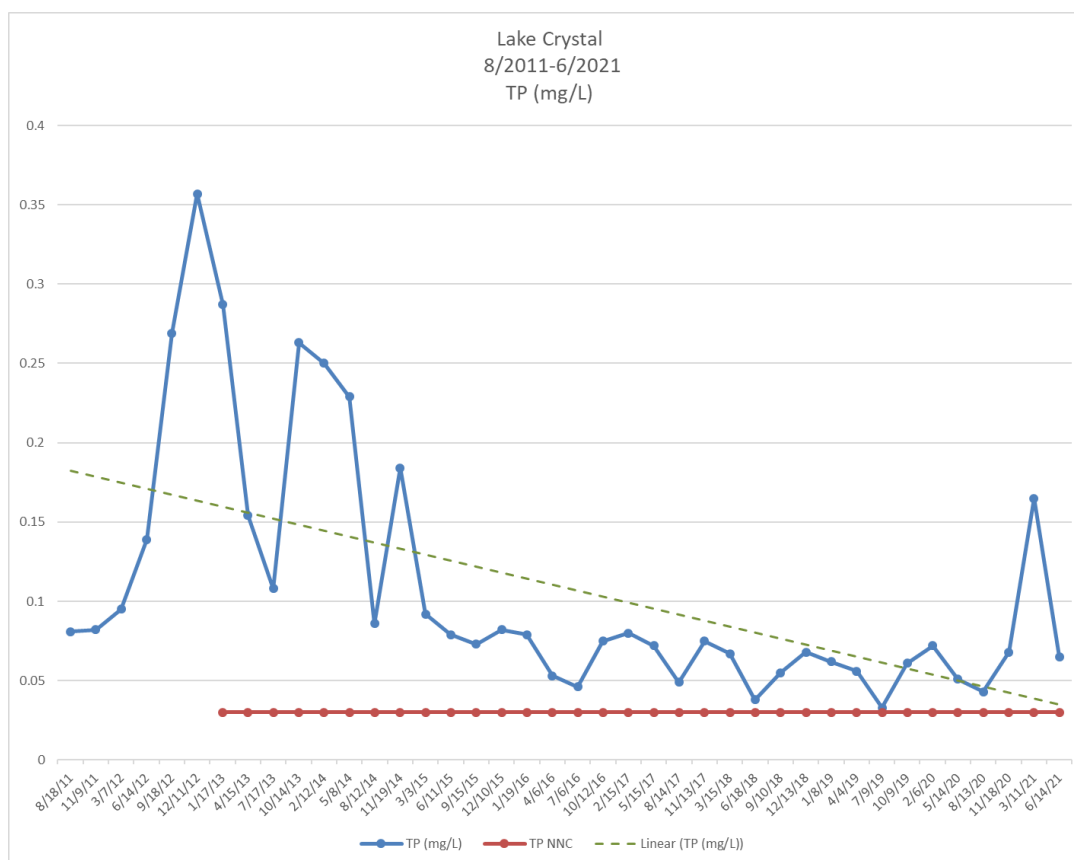


Figure 14. Total Phosphorus/Numeric Nutrient Criteria for Crystal Lake

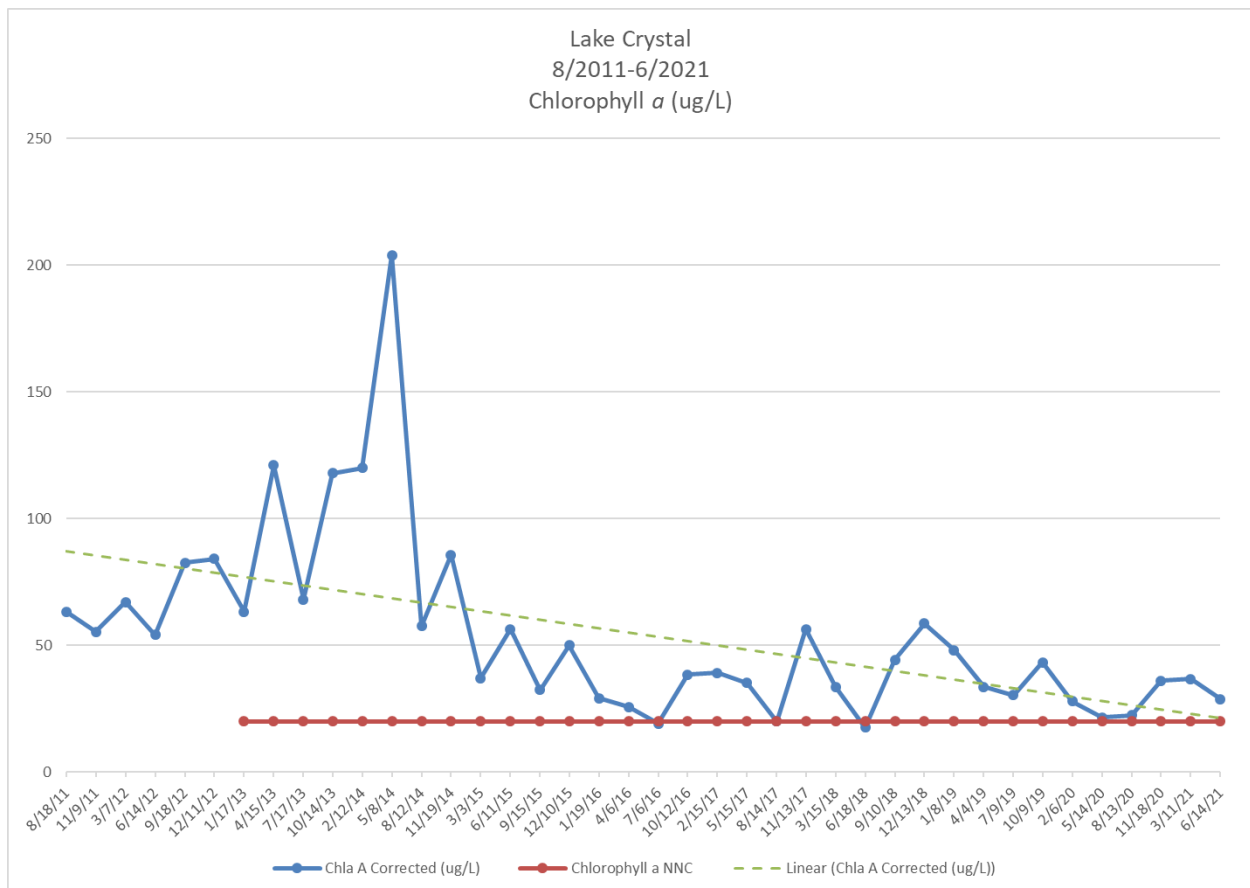


Figure 15. Chlorophyll *a*/Numeric Nutrient Criteria for Crystal Lake

Summary

Crystal Lake water quality monitoring results indicate TN, TP, and chlorophyll *a* exceed the site specific TMDL NNC. The ten year trend for all three parameters indicates a continued decrease in nutrient levels indicative of improving water quality. Beginning in 2018, the change in NNC for TN was a result of the DEP assigned site specific requirement.

Gibson

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.4
pH (std unit)	9.05
Conductivity (uS)	225.6
Dissolved Oxygen (mg/L)	7.38
Secchi Depth (m)	0.50

Table 17. Field Measurements for Lake Gibson

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	10
Total Alkalinity (mg/L)	77.4
Total Ammonia (mg/L)	0.018
Total Kjeldahl Nitrogen (mg/L)	2.07
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	17
Total Suspended Solids (mg/L)	21.4

Table 18. Analytical Results for Lake Gibson

Lake Gibson Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation of Annual Geometric Mean)</i>	1.05	0.03	20
9/8/11	0.775	0.113	20.8
12/5/11	0.788	0.071	6.4
2/1/12	2.446	0.071	9.6
5/2/12	2.79	0.137	129.0
8/8/12	0.856	0.069	15.2
11/5/12	0.534	0.055	7.2
1/9/13	0.5	0.054	5.6
2/6/13	0.493	0.05	3.2
4/15/13	0.77	0.064	14.4
7/15/13	1.04	0.097	32.2
10/8/13	1.060	0.080	19.2
2/4/14	0.750	0.052	10.4
5/13/14	0.760	0.070	8.8
8/12/14	1.090	0.080	38.4
11/19/14	0.970	0.075	22.4
3/2/15	0.860	0.058	22.4
6/3/15	1.110	0.086	36.8
9/10/15	2.580	0.204	164.0
12/9/15	1.460	0.108	51.1
1/19/16	1.290	0.111	38.4
4/6/16	1.420	0.108	36.5
7/13/16	1.640	0.125	73.4
10/5/16	1.710	0.124	69.6
2/15/17	1.370	0.123	47.1
5/15/17	2.370	0.205	92.7
8/9/17	1.760	0.121	70.8
11/1/17	1.790	0.127	65.4
3/13/18	1.620	0.109	51.1
6/13/18	1.760	0.096	66.8
9/11/18	1.420	0.091	50.1
12/6/18	1.520	0.113	59.4
1/14/19	1.060	0.088	42.9
4/16/19	0.750	0.050	54.8
7/11/19	1.860	0.118	61.7
10/15/19	1.560	0.116	61.1
2/13/20	1.360	0.097	52.1
5/12/20	2.060	0.163	74.1
8/11/20	1.820	0.065	47.2
11/4/20	1.810	0.146	20.8
3/2/21	1.380	0.092	28.0
6/8/21	2.07	0.110	45.4

Table 19. **Red shaded** indicates quarterly result is at or exceeds the applicable NNC; **Green shaded** indicates quarterly result is below the applicable NNC

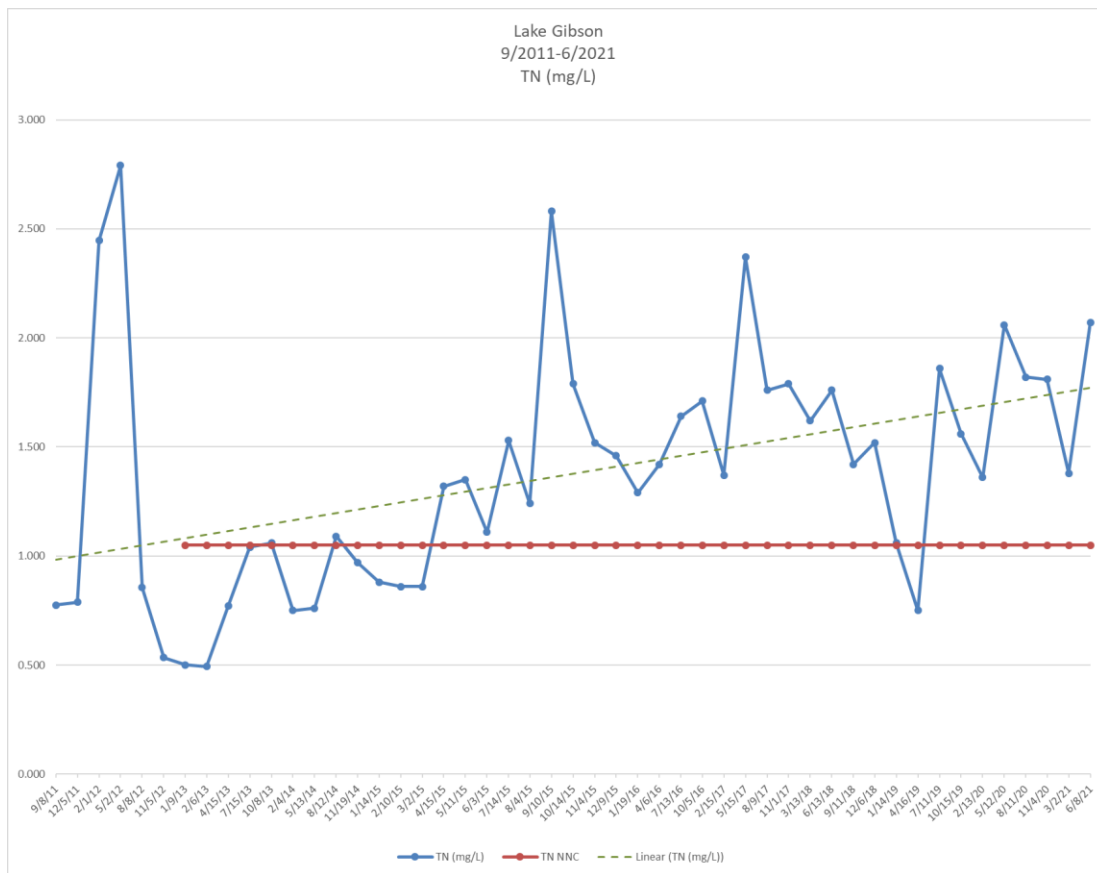


Figure 16. Total Nitrogen/Numeric Nutrient Criteria for Lake Gibson

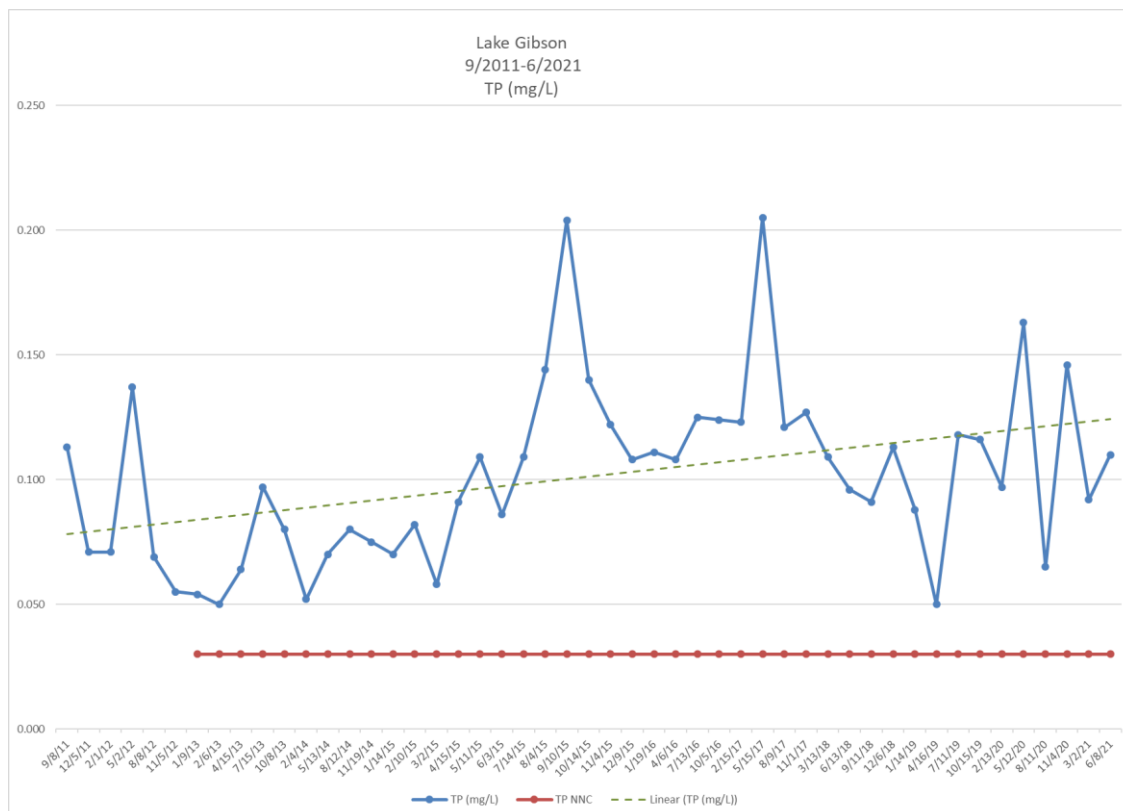


Figure 17. Total Phosphorus/Numeric Nutrient Criteria for Lake Gibson

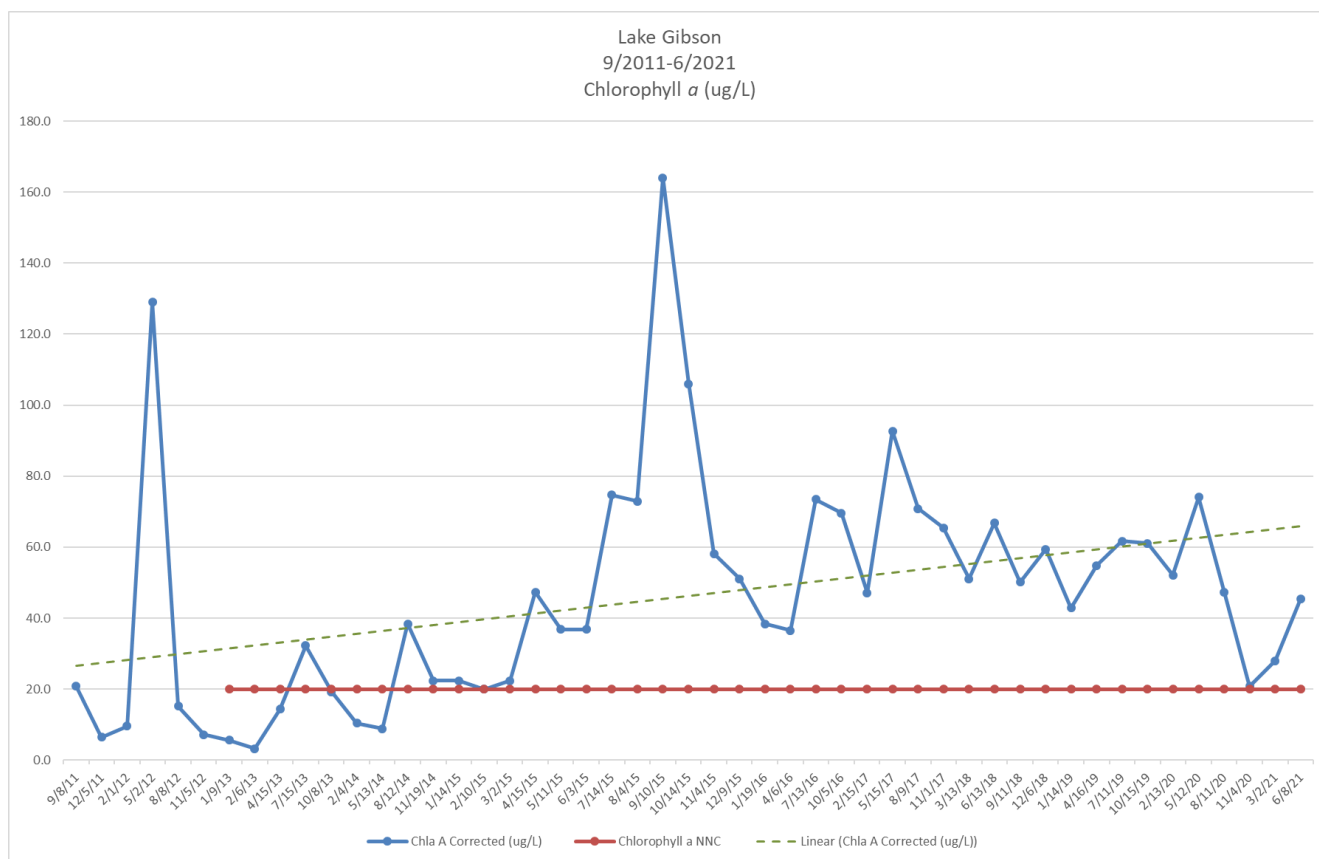


Figure 18. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Gibson

Summary

Water quality monitoring results for Lake Gibson show that concentrations of TN, TP, and chlorophyll *a* exceed the NNC. The trend for all three parameters continues to increase over the last ten year period.

Lake Hollingsworth

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/1/2021
Temperature (°C)	27.4
pH (std unit)	7.82
Conductivity (uS)	175.0
Dissolved Oxygen (mg/L)	7.47
Secchi Depth (m)	0.60

Table 20. Field Measurements for Lake Hollingsworth

Analytical Results	
Parameter (unit)	6/1/2021
Turbidity (NTU)	12.0
Total Alkalinity (mg/L)	48.2
Total Ammonia (mg/L)	0.048
Total Kjeldahl Nitrogen (mg/L)	2.33
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	17
Total Suspended Solids (mg/L)	15.2

Table 21. Analytical Results for Lake Hollingsworth

Lake Hollingsworth Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (TMDL Site Specific)</i>	0.86	0.03	20
8/2/11	2.628	0.099	100.0
11/1/11	2.859	0.129	116.0
2/1/12	2.787	0.110	88.1
5/2/12	3.827	0.141	172.0
8/7/12	2.157	0.068	56.1
11/5/12	2.252	0.064	70.9
1/15/13	2.200	0.087	82.1
4/10/13	2.050	0.121	57.4
7/16/13	1.510	0.078	45.4
10/14/13	1.880	0.086	50.1
2/12/14	1.860	0.073	62.1
5/7/14	1.880	0.064	58.2
8/6/14	1.900	0.059	64.1
11/5/14	2.480	0.089	77.1
3/5/15	2.160	0.079	92.1
6/17/15	1.920	0.053	63.7
9/15/15	1.790	0.048	59.3
12/7/15	2.330	0.085	92.1
1/7/16	2.530	0.103	105.0
4/11/16	2.800	0.092	112.0
7/7/16	2.020	0.049	64.9
10/3/16	1.680	0.060	60.1
2/6/17	2.000	0.067	72.1
5/9/17	2.340	0.064	76.1
8/7/17	1.530	0.055	51.9
11/13/17	2.410	0.075	111.0
3/6/18	2.590	0.091	106.0
6/12/18	2.310	0.066	61.3
9/10/18	1.630	0.057	60.9
12/11/18	2.330	0.080	100.0
1/9/19	2.360	0.091	114.0
4/3/19	2.800	0.112	124.0
7/2/19	1.140	0.026	105.0
10/8/19	1.950	0.061	76.1
2/17/20	1.940	0.074	94.1
5/11/20	2.320	0.071	72.1
8/4/20	1.630	0.066	44.1
11/2/20	2.220	0.088	58.7
3/1/21	1.600	0.068	50.5
6/1/21	2.33	0.075	53.7

Table 22. Current applicable NNC is the site-specific criteria based on FDEP TMDL Final Report 11/2017; Red shaded indicates quarterly result is at or exceeds the site specific NNC; Green shaded indicates quarterly result is below the applicable NNC

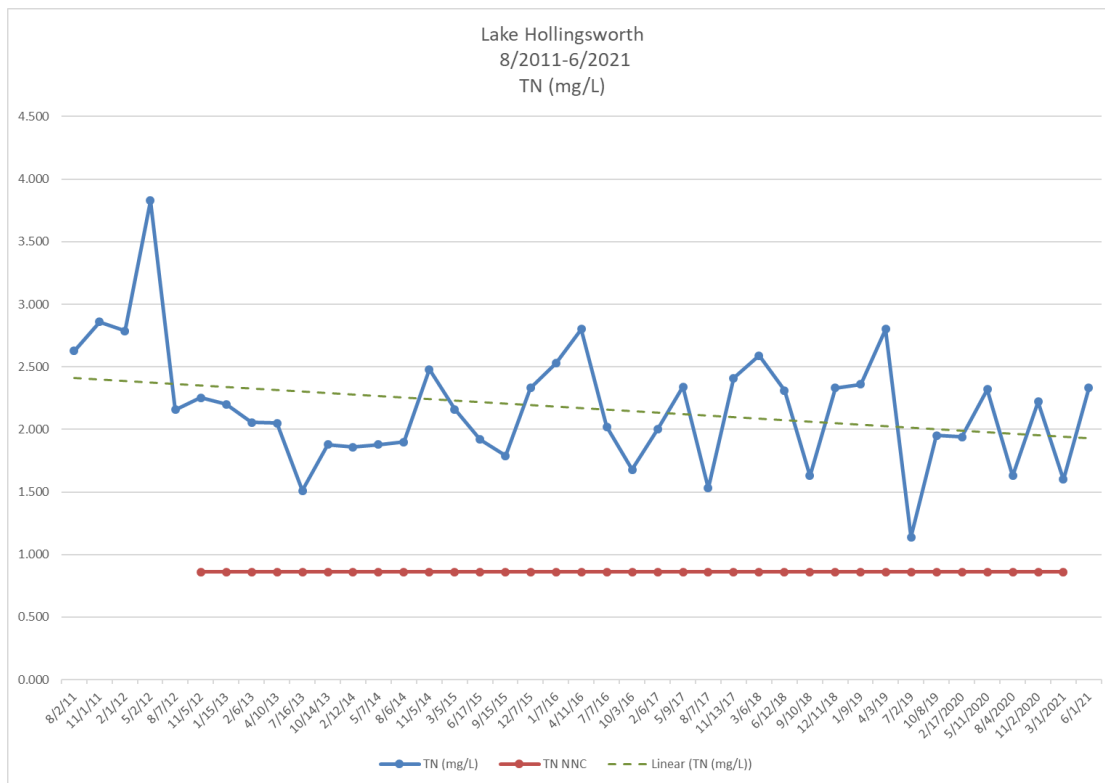


Figure 19. Total Nitrogen/Numeric Nutrient Criteria for Lake Hollingsworth

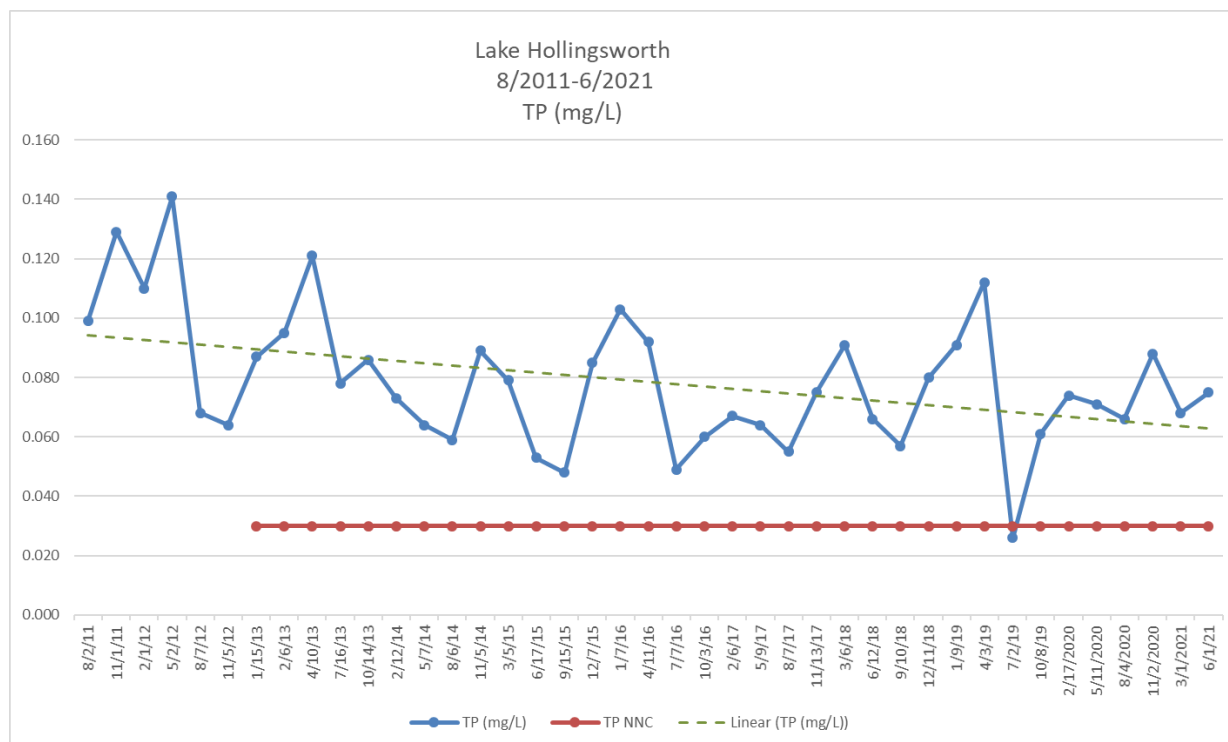


Figure 20. Total Phosphorus/Numeric Nutrient Criteria for Lake Hollingsworth

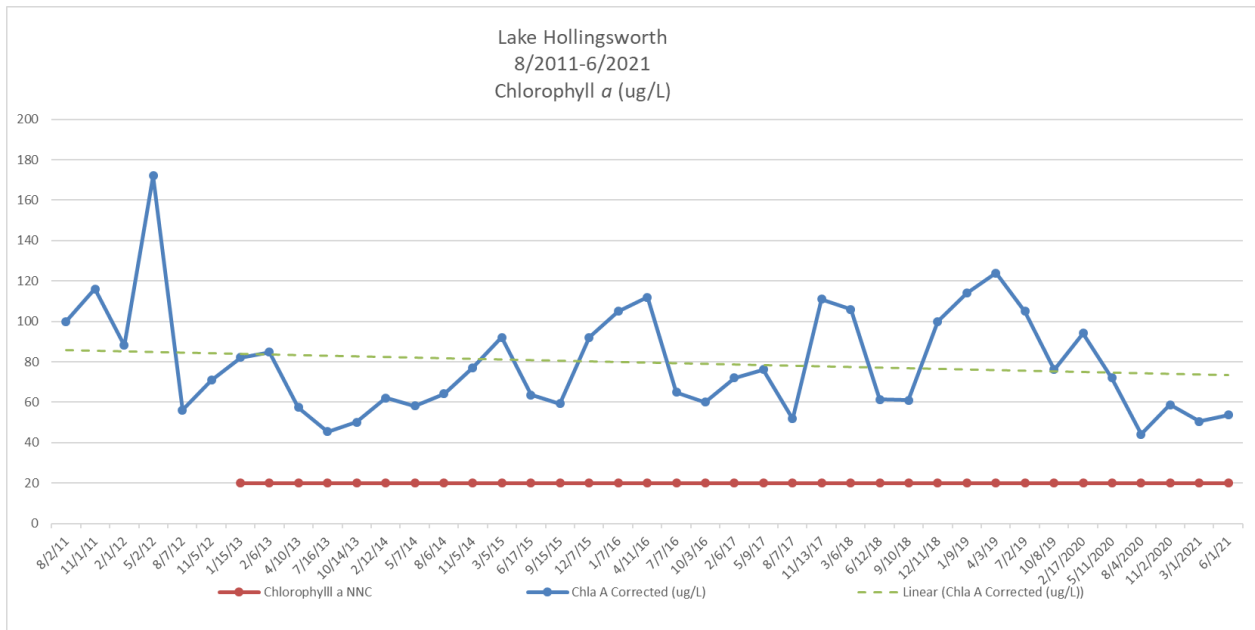


Figure 21. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Hollingsworth

Summary

Water quality monitoring results for Lake Hollingsworth report concentrations of TN, TP, and chlorophyll *a* exceed the TMDL site specific NNC. The trends for TN, TP and chlorophyll *a* concentration is decreasing which indicates improving water quality.

Lake Horney

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.6
pH (std unit)	7.68
Conductivity (uS)	175.0
Dissolved Oxygen (mg/L)	6.52
Secchi Depth (m)	0.45

Table 23. Field Measurements for Lake Horney

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	15
Total Alkalinity (mg/L)	53.4
Total Ammonia (mg/L)	0.027
Total Kjeldahl Nitrogen (mg/L)	2.29
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	30
Total Suspended Solids (mg/L)	34.0

Table 24. Analytical Results for Lake Horney

Lake Horney Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation Annual Geometric Mean)</i>	1.05	0.03	20
9/7/11	1.062	0.048	19.2
12/6/11	0.776	0.02	3.0
2/6/12	0.727	0.021	3.0
5/1/12	1.952	0.037	9.2
8/9/12	1.195	0.064	35.2
11/7/12	1.822	0.129	50.0
2/4/13	1.136	0.096	27.2
5/8/13	2.349	0.193	68.9
11/20/13	1.729	0.106	43.3
1/8/14	1.860	0.128	46.7
4/1/14	1.890	0.129	24.8
9/16/14	1.730	0.136	43.8
10/23/14	1.930	0.154	49.4
3/17/15	1.560	0.118	43.1
6/10/15	3.030	0.270	98.1
9/16/15	2.060	0.200	63.3
12/7/15	2.010	0.166	65.4
1/1/16	NS	NS	NS
4/1/16	NS	NS	NS
7/1/16	NS	NS	NS
10/11/16	2.07	0.190	68.4
1/17/17	3.12	0.242	94.1
4/18/17	6.62	0.439	270
7/19/17	3.19	0.281	110
11/8/17	2.050	0.168	50.1
3/6/18	2.74	0.222	80.1
6/5/18	2.19	0.157	76.1
9/11/18	1.610	0.117	41.4
12/4/18	1.860	0.178	40.1
1/9/19	1.610	0.162	42.1
4/23/19	1.540	0.096	58.1
7/9/19	1.710	0.178	33.6
10/23/19	1.460	0.145	43.1
2/12/20	1.150	0.084	20.0
5/27/20	2.390	0.230	38.7
8/19/20	1.520	0.158	26.4
11/17/20	1.680	0.199	49.7
3/16/21	2.190	0.230	41.4
6/8/21	2.29	0.218	31.2

Table 25. NS=Not Sampled; **Red font** indicates quarterly result is at or the applicable NNC

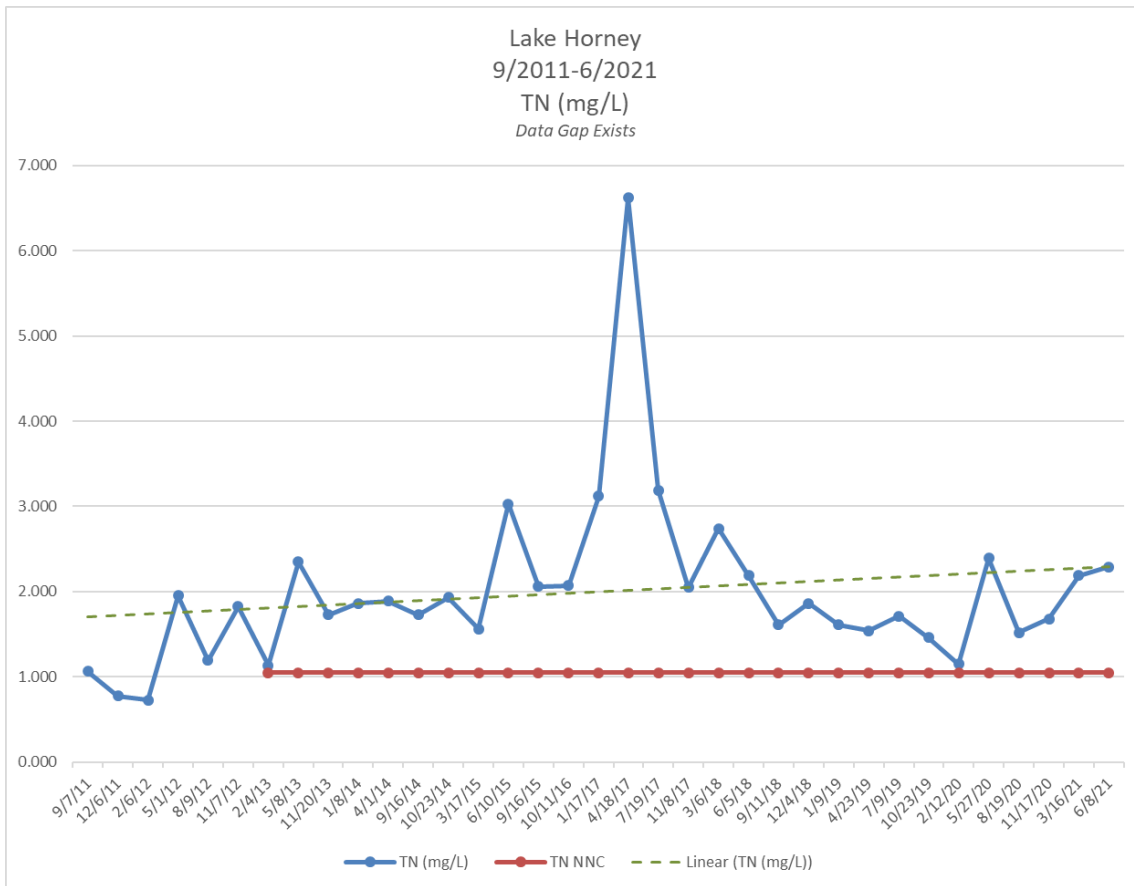


Figure 22. Total Nitrogen/Numeric Nutrient Criteria for Lake Horney

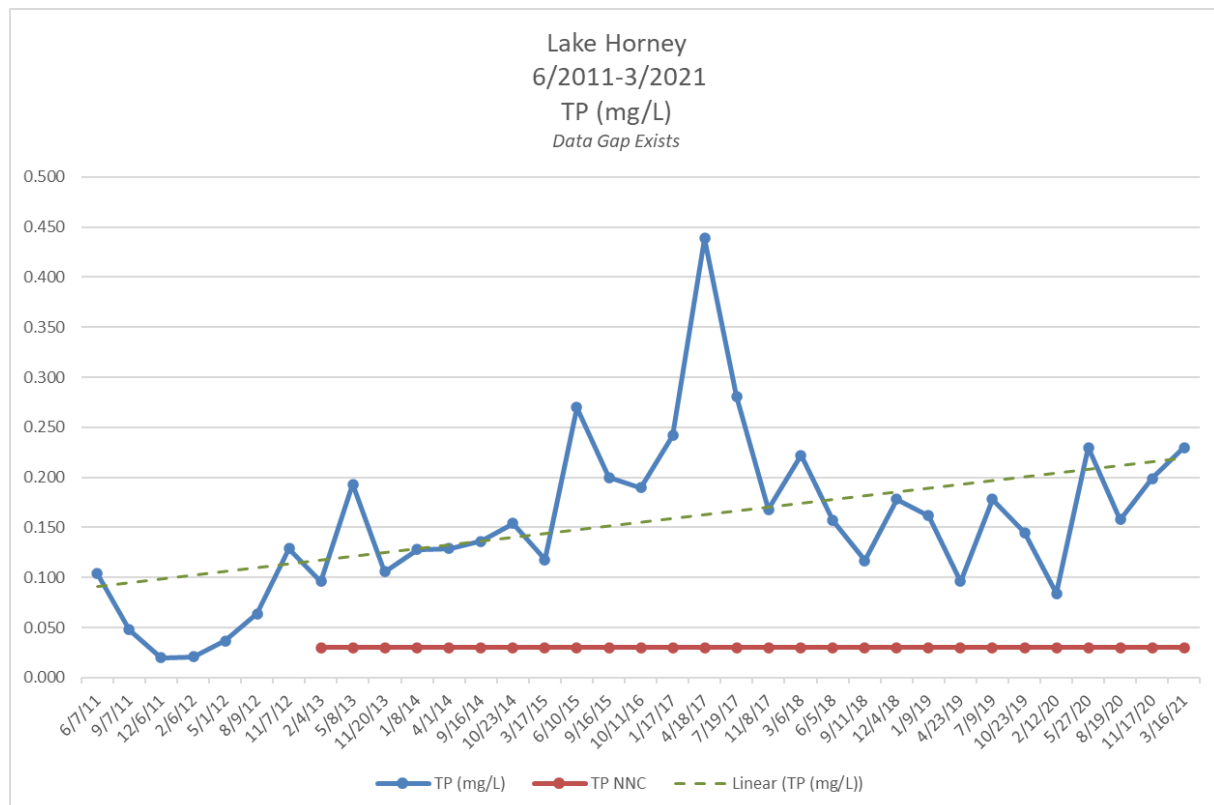


Figure 23. Total Phosphorus/Numeric Nutrient Criteria for Lake Horney

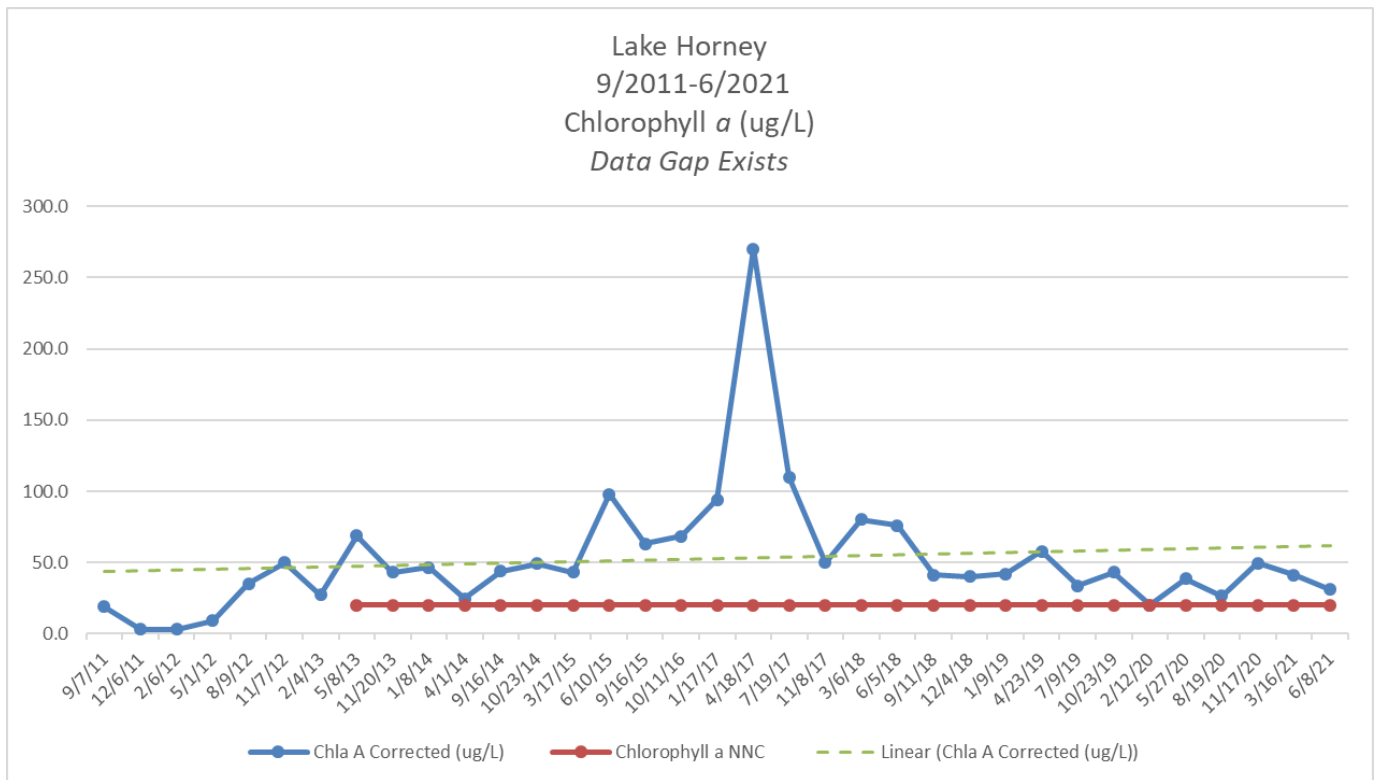


Figure 24. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Horney

Summary

Water quality monitoring results for Lake Horney indicate concentrations of TN, TP, and chlorophyll *a* continue to exceed the NNC. The ten year trend lines for all three parameters continues to increase. This may be due a lack of sufficient vegetation in the lake.

Lake Hunter

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/1/2021
Temperature (°C)	26.9
pH (std unit)	8.76
Conductivity (uS)	168.8
Dissolved Oxygen (mg/L)	4.57
Secchi Depth (m)	0.15

Table 26. Field Measurements for Lake Hunter

Analytical Results	
Parameter (unit)	6/1/2021
Turbidity (NTU)	37
Total Alkalinity (mg/L)	58.6
Total Ammonia (mg/L)	0.084
Total Kjeldahl Nitrogen (mg/L)	7.12
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	17
Total Suspended Solids (mg/L)	83

Table 27. Analytical Results for Lake Horney

Lake Hunter Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation of Annual Geometric Mean)</i>	1.05	0.03	20
9/7/11	4.667	0.301	180.0
12/5/11	3.807	0.223	208.0
1/4/12	3.614	0.296	203.0
4/2/12	5.326	0.205	176.0
7/10/12	2.2	0.101	66.1
10/8/12	2.822	0.193	106.0
1/8/13	3.895	0.238	176.0
1/15/13	3.14	0.155	136.0
4/10/13	3.03	0.162	116.0
7/16/13	3.51	0.184	122.0
10/14/13	0.110	0.158	110.0
2/12/14	2.450	0.129	90.1
4/2/14	2.530	0.142	98.1
5/7/14	2.750	0.161	96.1
8/6/14	2.560	0.098	73.4
11/5/14	3.660	0.265	130.0
3/3/15	1.430	0.068	41.4
6/17/15	2.810	0.111	93.5
9/15/15	3.170	0.227	108.0
12/7/15	3.370	0.264	132.0
1/7/16	3.330	0.260	128.0
4/11/16	3.560	0.279	150.0
7/7/16	1.890	0.094	60.1
10/3/16	1.590	0.131	65.7
2/6/17	2.060	0.109	87.1
5/9/17	3.900	0.185	192.0
8/7/17	1.810	0.113	67.1
11/7/17	2.360	0.126	122.0
3/6/18	3.26	0.277	146.0
6/12/18	2.810	0.230	110.0
9/10/18	2.240	0.144	117.0
12/11/18	2.890	0.239	138.0
1/9/19	2.490	0.206	124.0
4/3/19	4.130	0.403	156.0
7/2/19	1.000	0.069	104.0
10/8/19	2.700	0.265	110.0
2/17/20	4.300	0.331	196.0
5/11/20	6.460	0.546	220.0
8/4/20	3.410	0.238	98.1
11/2/20	3.930	0.264	138.0
3/1/21	3.830	0.279	156.0
6/1/21	7.12	0.555	236.0

Table 28. Red font indicates quarterly result is at or exceeds the applicable NNC; Green font indicates quarterly result is below the applicable NNC

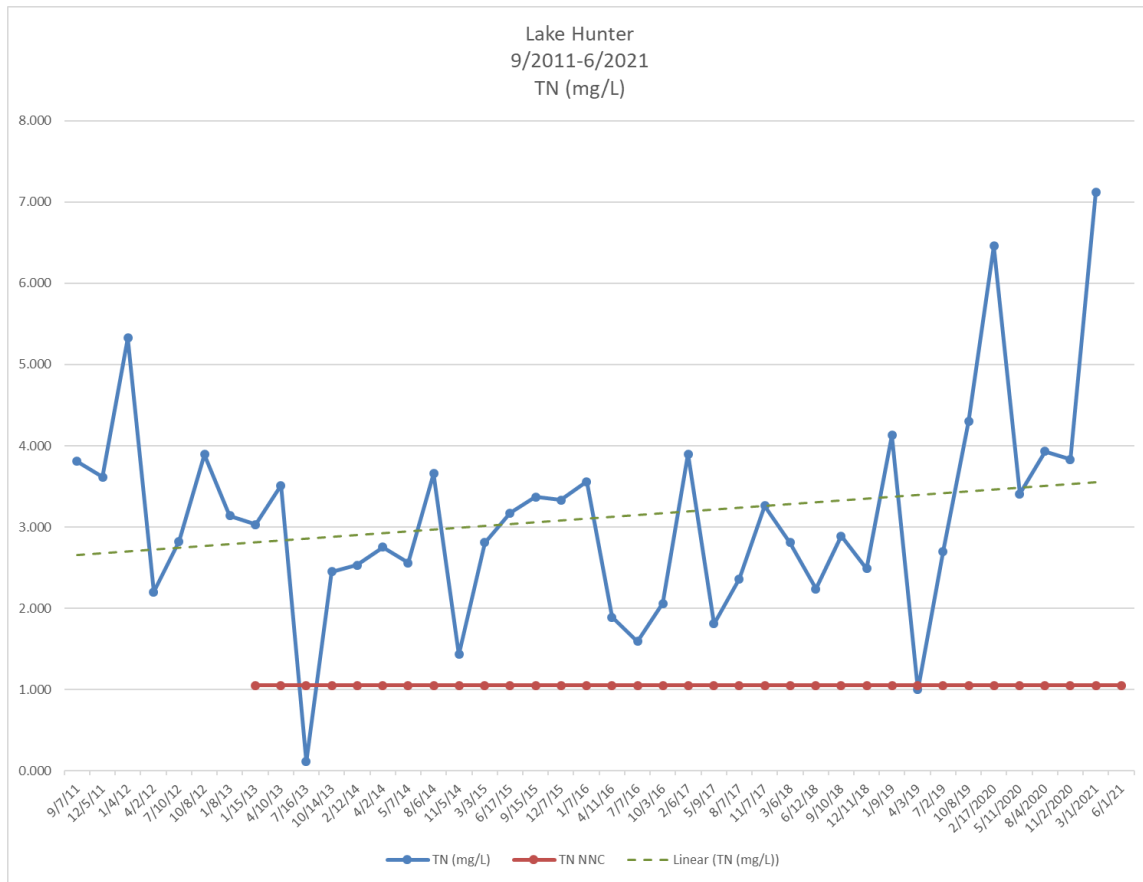


Figure 25. Total Nitrogen/Numeric Nutrient Criteria for Lake Hunter

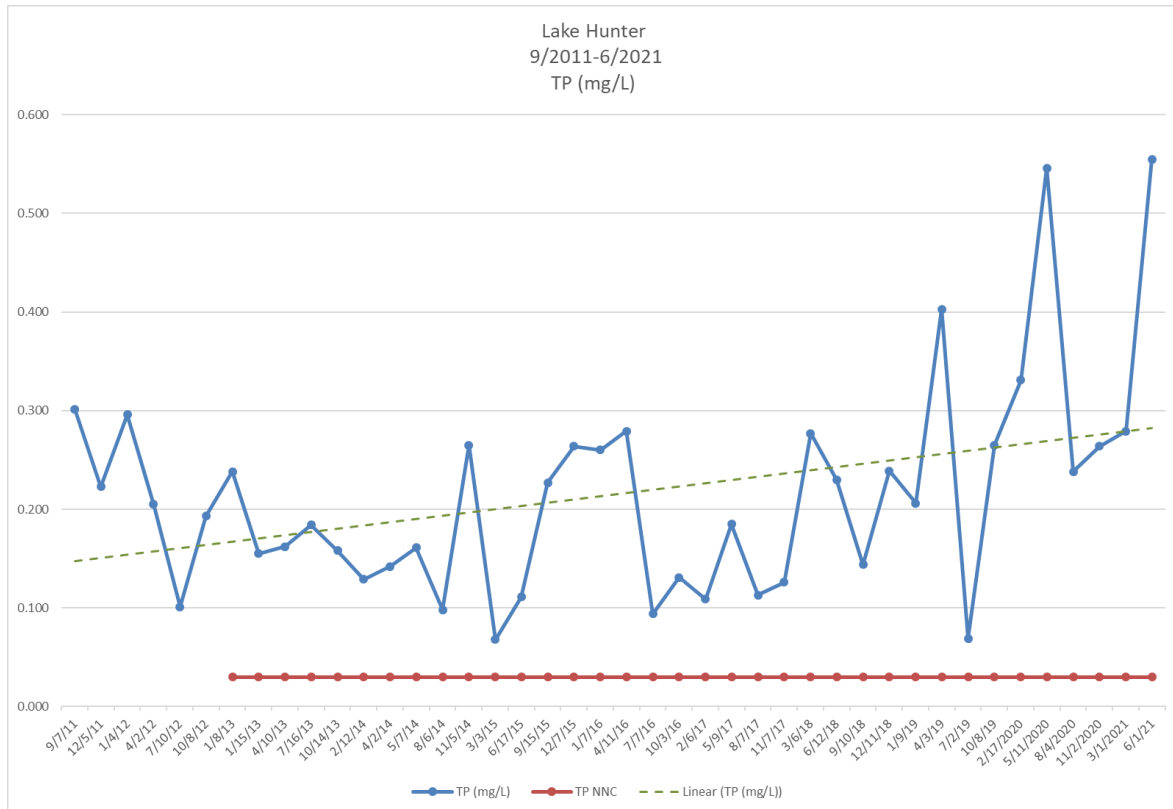


Figure 26. Total Phosphorous/Numeric Nutrient Criteria for Lake Hunter

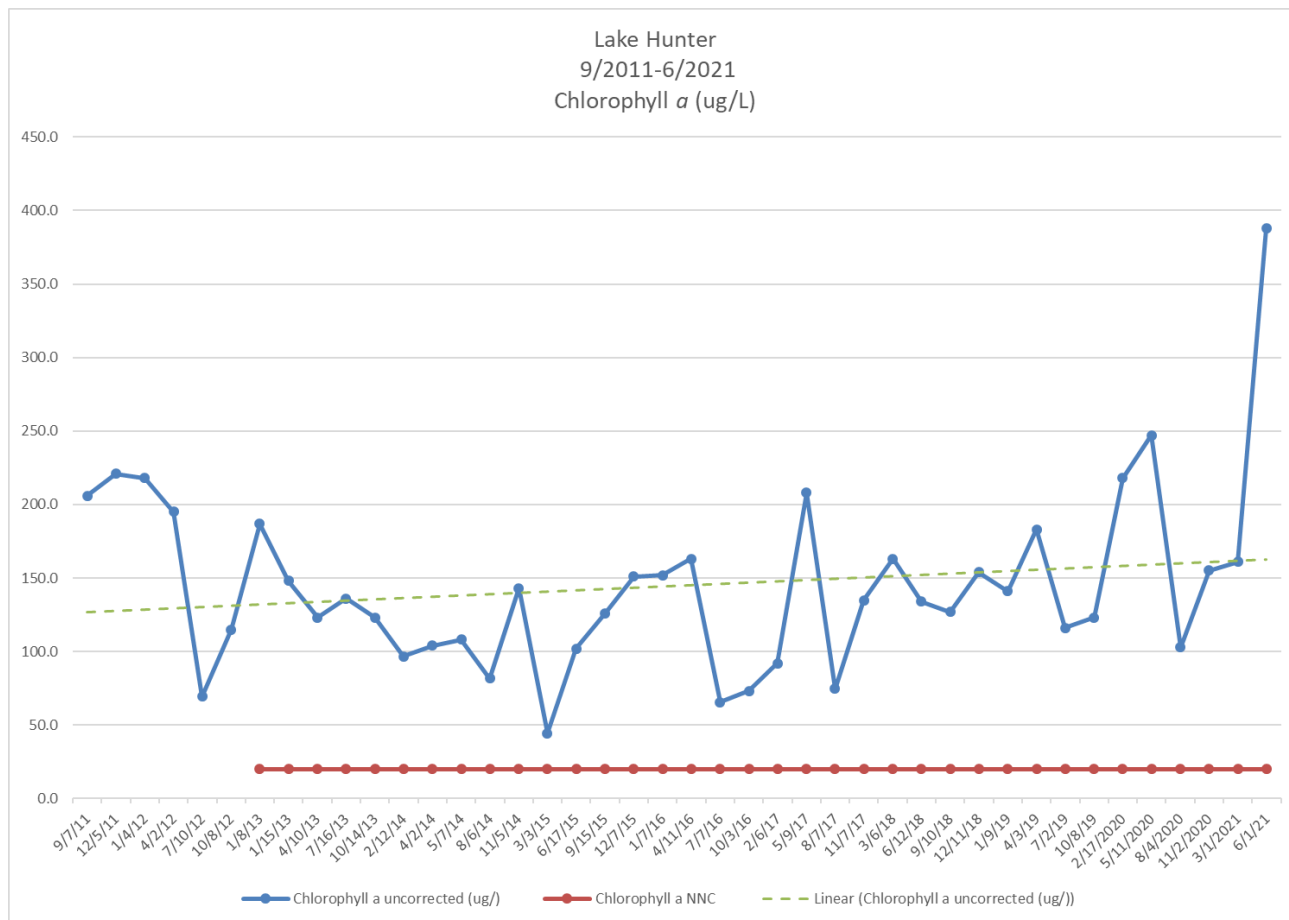


Figure 27. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Hunter

Summary

Lake Hunter water quality monitoring results indicate concentrations of TN, TP, and chlorophyll *a* exceed the NNC. The ten year trend for all concentrations of TN, TP, and chlorophyll *a* continues to increase.

Lake John

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/1/2021
Temperature (°C)	27.5
pH (std unit)	9.51
Conductivity (uS)	223.9
Dissolved Oxygen (mg/L)	7.29
Secchi Depth (m)	0.50

Table 29. Field Measurements for Lake John

Analytical Results	
Parameter (unit)	6/1/2021
Turbidity (NTU)	23
Total Alkalinity (mg/L)	78.4
Total Ammonia (mg/L)	0.054
Total Kjeldahl Nitrogen (mg/L)	2.67
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.203
Color (Pt-Co)	15
Total Suspended Solids (mg/L)	35.5

Table 30. Analytical Results for Lake John

Lake John Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation (Annual Geometric Mean)</i>	1.05	0.03	20
9/1/11	1.561	0.321	68.1
12/1/11	1.135	0.252	65.7
3/13/12	1.71	0.332	78.1
6/12/12	1.89	0.3	75.3
9/12/12	1.45	0.311	84.9
12/11/12	1.59	0.262	76.1
1/15/13	1.39	0.227	56.1
4/10/13	1.51	0.346	49.4
7/16/13	1.48	0.302	68.9
10/14/13	1.400	0.277	56.1
2/12/14	1.590	0.202	78.1
5/7/14	1.610	0.246	79.8
8/6/14	1.620	0.238	68.1
11/5/14	1.530	0.272	67.1
3/5/15	1.450	0.301	74.8
6/17/15	1.760	0.341	73.7
9/15/15	1.520	0.414	88.1
12/7/15	1.420	0.292	69.7
1/7/16	1.410	0.324	64.9
4/11/16	1.790	0.394	72.1
7/7/16	1.620	0.257	79.3
10/3/16	1.290	0.362	68.1
2/6/17	1.520	0.234	56.1
5/9/17	2.640	0.411	106.0
8/7/17	1.170	0.288	51.1
11/7/17	1.150	0.223	41.1
3/6/18	1.970	0.410	106.0
6/12/18	1.460	0.299	59.3
9/10/18	1.330	0.283	69.7
12/11/18	1.680	0.327	78.1
1/9/19	1.430	0.347	78.1
4/3/19	2.000	0.429	86.8
7/2/19	1.710	0.282	117.0
10/8/19	1.780	0.343	56.9
2/17/20	1.920	0.310	94.1
5/11/20	3.170	0.477	134.0
8/4/20	1.840	0.355	70.8
11/2/20	1.350	0.289	48.1
3/1/21	1.490	0.313	44.9
6/1/21	2.67	0.538	110

Table 31. Red font indicates quarterly result is at or exceeds applicable NNC

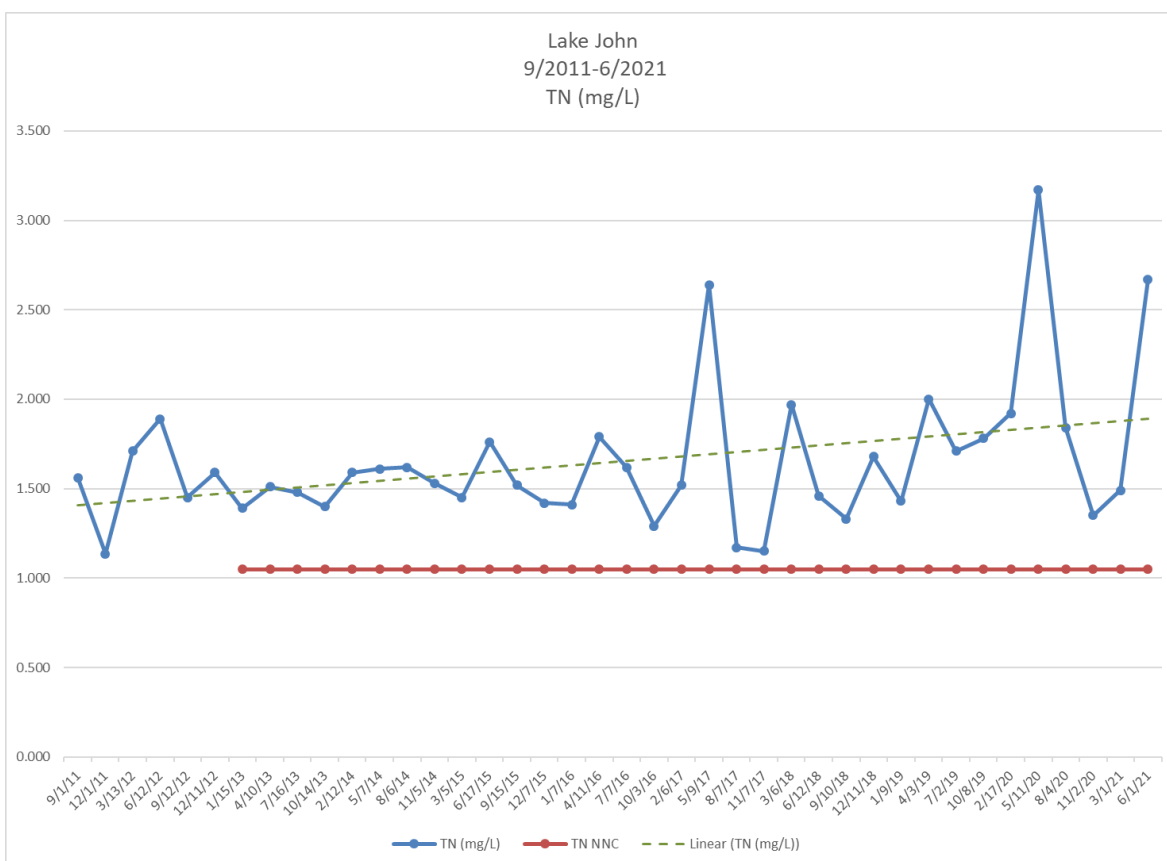


Figure 28. Total Nitrogen/Numeric Nutrient Criteria for Lake John

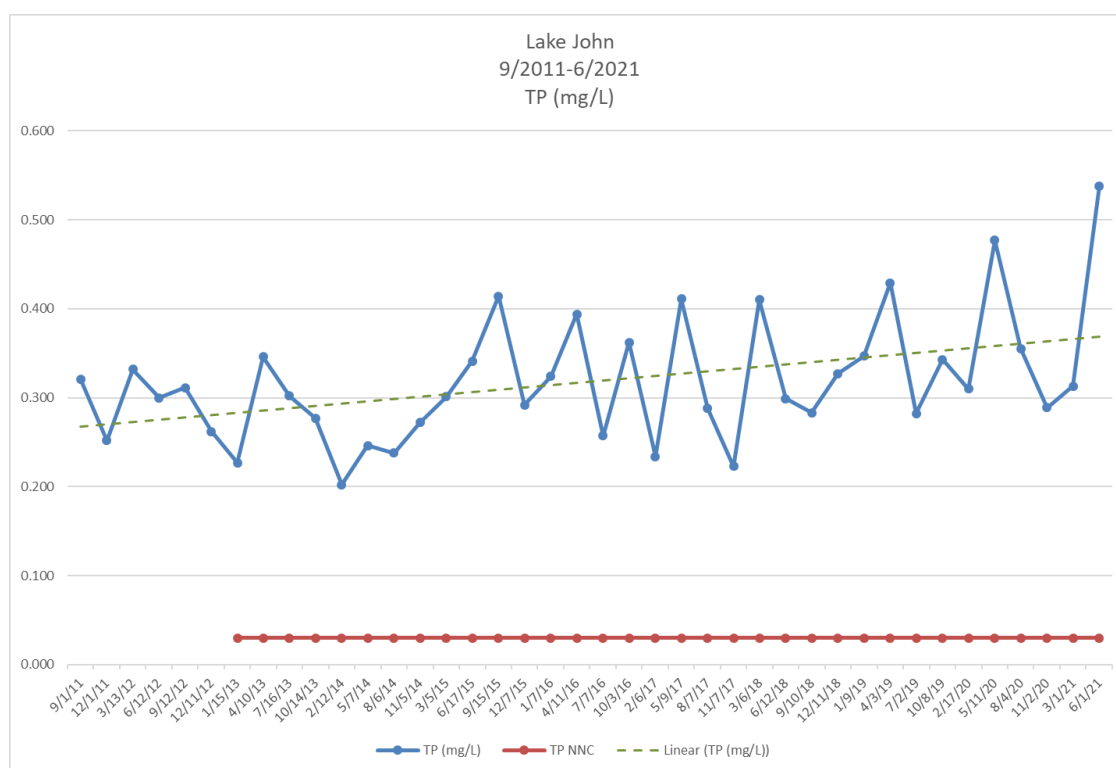


Figure 29. Total Phosphorous/Numeric Nutrient Criteria for Lake John

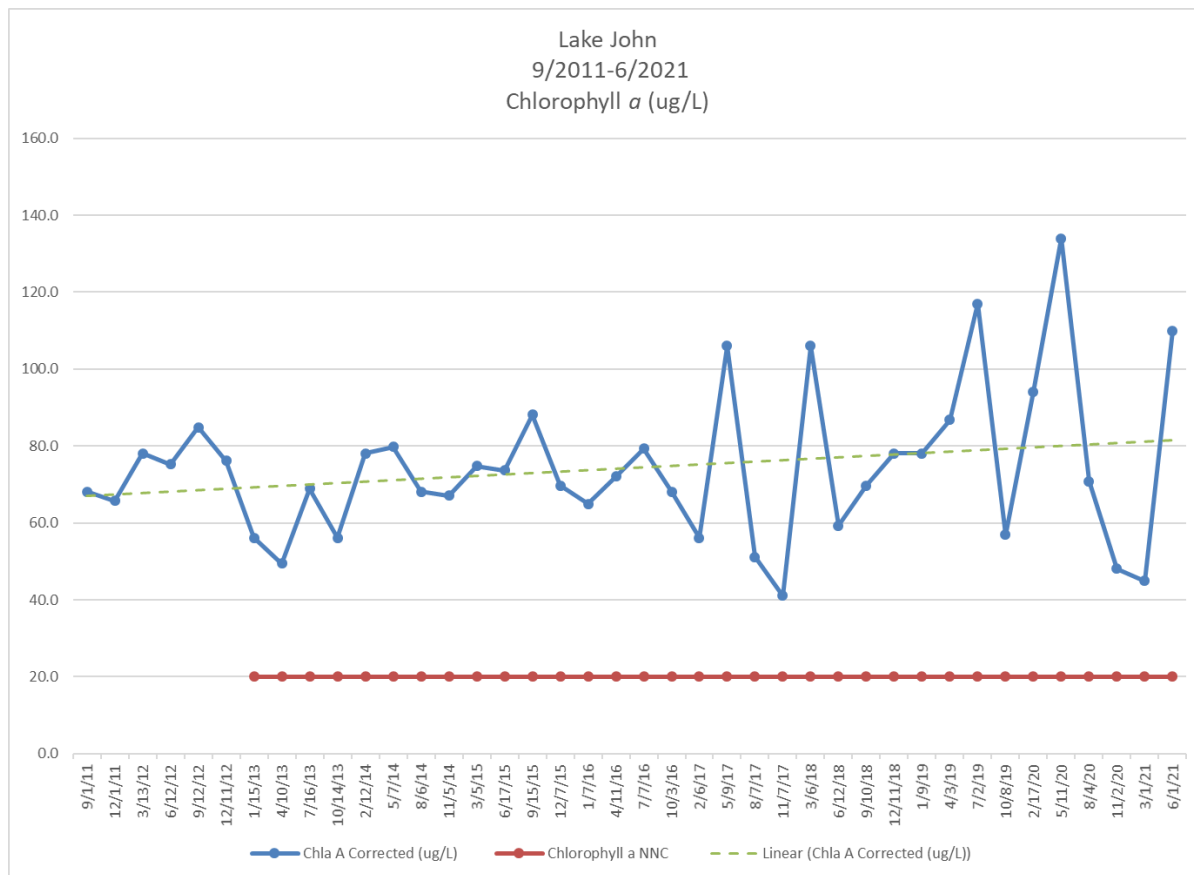


Figure 30. Chlorophyll *a*/Numeric Nutrient Criteria for Lake John

Summary

Water quality monitoring results for Lake John show concentrations for TN, TP, and chlorophyll *a* currently exceed the NNC. The ten year trend indicates concentrations of TN, TP and chlorophyll *a* is increasing.

Lake Mirror

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.5
pH (std unit)	7.76
Conductivity (uS)	251.6
Dissolved Oxygen (mg/L)	6.14
Secchi Depth (m)	0.60

Table 32. Field Measurements for Lake Mirror

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	5.0
Total Alkalinity (mg/L)	99.7
Total Ammonia (mg/L)	0.026
Total Kjeldahl Nitrogen (mg/L)	1.40
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	12
Total Suspended Solids (mg/L)	8.4

Table 33. Analytical Results for Lake Mirror

Lake Mirror Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation (Annual Geometric Mean)</i>	1.05	0.03	20
9/7/11	1.323	0.11	64.9
12/6/11	1.522	0.102	58.5
2/6/12	4.538	0.077	25.6
5/1/12	2.435	0.096	45.6
8/9/12	1.54	0.071	55.2
11/7/12	1.635	0.138	54.5
2/4/13	1.627	0.105	44.0
5/7/13	1.079	0.067	32.8
11/20/13	1.039	0.097	54.5
1/7/14	1.280	0.111	60.1
4/1/14	1.130	0.088	34.9
9/16/14	1.040	0.062	28.8
10/22/14	1.250	0.086	42.5
3/17/15	0.990	0.057	19.2
6/9/15	0.960	0.051	23.2
9/15/15	1.200	0.076	50.5
12/7/15	1.400	0.127	56.9
1/1/16	NS	NS	NS
4/1/16	NS	NS	NS
7/1/16	NS	NS	NS
10/11/16	1.37	0.114	64.1
1/17/17	1.21	0.084	41.7
4/19/17	1.07	0.058	24.8
7/18/17	1.15	0.068	43.3
11/8/17	1.170	0.068	46.5
3/6/18	1.18	0.106	36.1
6/5/18	0.88	0.063	29.6
9/11/18	0.940	0.073	38.5
12/4/18	0.99	0.078	34.4
1/9/19	1.050	0.114	41.7
4/23/19	0.890	0.058	32.0
7/9/19	0.700	0.054	56.9
10/23/19	1.470	0.144	60.9
2/12/20	1.100	0.087	27.9
5/27/20	1.220	0.088	46.5
8/19/20	1.200	0.087	48.1
11/17/20	1.520	0.157	68.1
3/16/21	0.990	0.067	27.2
6/8/21	1.40	0.081	44.9

Table 34. NS=Not Sampled; **Red font** indicates quarterly result is at or exceeds applicable NNC; **Green font** indicates quarterly result is below applicable NNC

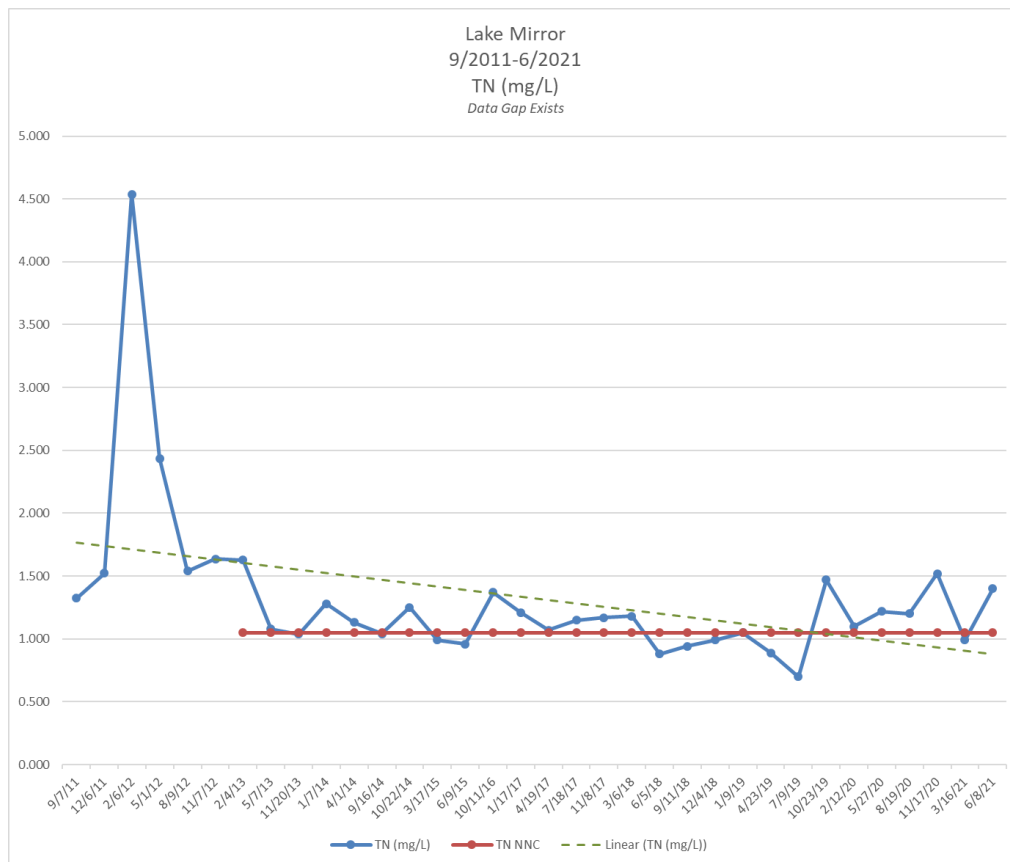


Figure 31. Total Nitrogen/Numeric Nutrient Criteria for Lake Mirror

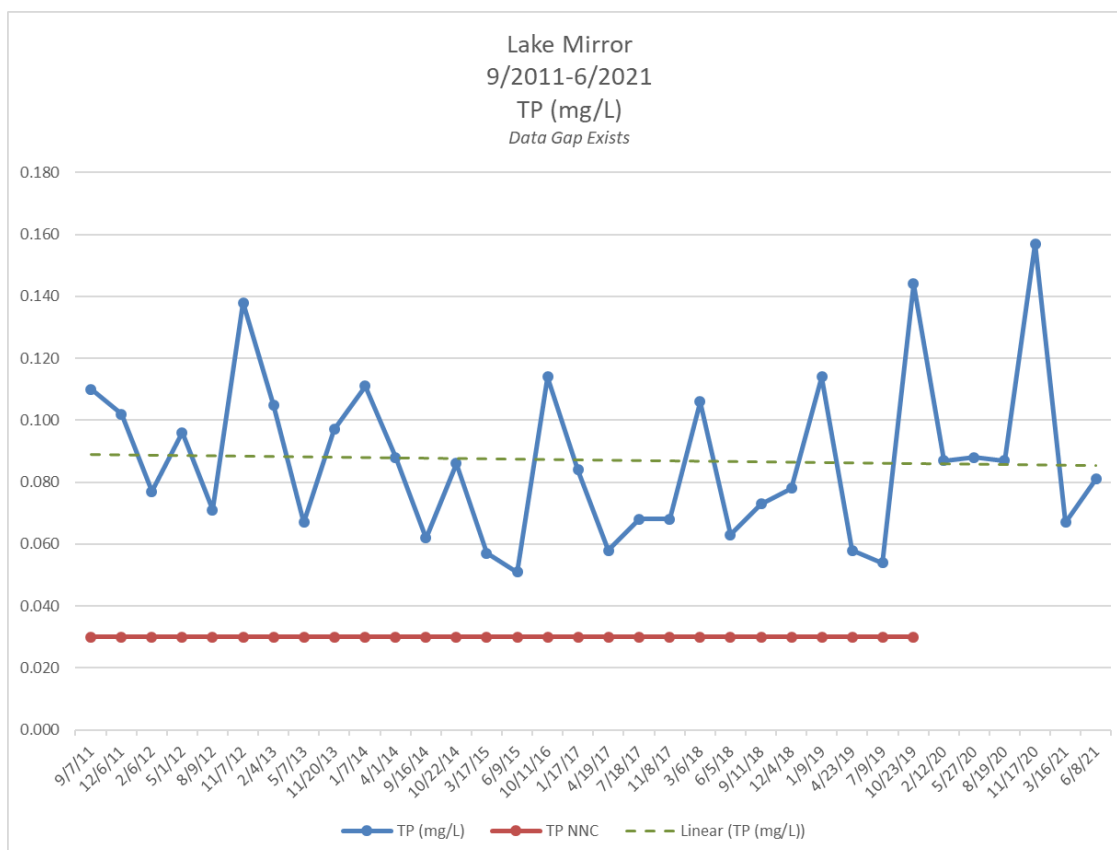


Figure 32. Total Phosphorous/Numeric Nutrient Criteria for Lake Mirror

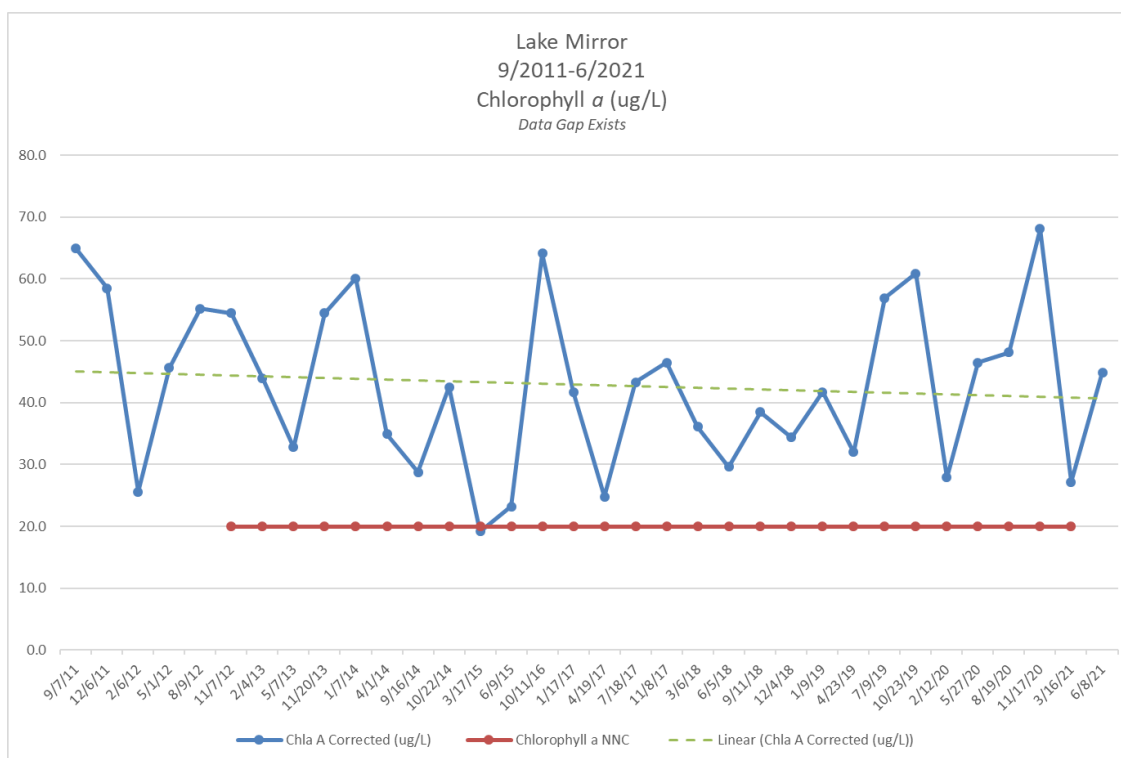


Figure 33. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Mirror

Summary

Water quality monitoring results for Lake Mirror show concentrations for TN, TP, and chlorophyll *a* currently exceed the NNC. The ten year trend indicates concentrations of TN and chlorophyll *a* continue to decrease. The same trend line period for TP is nearly level.

Lake Morton

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.4
pH (std unit)	8.73
Conductivity (uS)	136.3
Dissolved Oxygen (mg/L)	8.42
Secchi Depth (m)	0.40

Table 35. Field Measurements for Lake Morton

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	14
Total Alkalinity (mg/L)	59.0
Total Ammonia (mg/L)	0.030
Total Kjeldahl Nitrogen (mg/L)	2.23
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	12
Total Suspended Solids (mg/L)	16.4

Table 36. Analytical Results for Lake Morton

Lake Morton Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation (Annual Geometric Mean))</i>	1.05	0.03	20
9/7/11	1.924	0.092	64.9
12/6/11	2.073	0.118	101.0
2/6/12	1.57	0.112	52.9
5/1/12	1.825	0.071	45.6
8/9/12	1.183	0.041	36.6
11/7/12	2.005	0.137	85.4
2/4/13	1.197	0.123	61.7
5/7/13	1.99	0.083	72.1
11/20/13	2.206	0.170	97.1
1/8/14	2.460	0.203	93.3
4/1/14	1.540	0.095	52.1
9/17/14	1.540	0.073	51.3
10/23/14	2.370	0.091	86.5
3/17/15	1.600	0.082	44.1
6/10/15	1.590	0.065	44.1
9/15/15	1.560	0.073	57.7
12/7/15	2.470	0.147	93.7
1/1/16	NS	NS	NS
4/1/16	NS	NS	NS
7/1/16	NS	NS	NS
10/11/16	2.35	0.089	82.8
1/18/17	1.95	0.146	83.6
4/18/17	2.10	0.149	75.3
7/18/17	1.43	0.063	43.3
11/8/17	2.130	0.131	76.1
3/6/18	1.94	0.189	72.6
6/5/18	2.01	0.110	85.4
9/11/18	1.80	0.076	97.7
12/4/18	2.16	0.131	107.0
1/9/19	1.850	0.148	94.1
4/23/19	1.610	0.090	54.5
7/9/19	1.490	0.056	82.7
10/23/19	2.160	0.108	92.1
2/12/20	2.280	0.176	97.5
5/27/20	2.250	0.095	52.1
8/19/20	2.160	0.080	67.3
11/17/20	2.200	0.128	32.0
3/16/21	1.750	0.109	48.1
6/8/21	2.23	0.101	76.1

Table 37. NS=Not Sampled; Red font indicates quarterly result is at or exceeds the applicable NNC

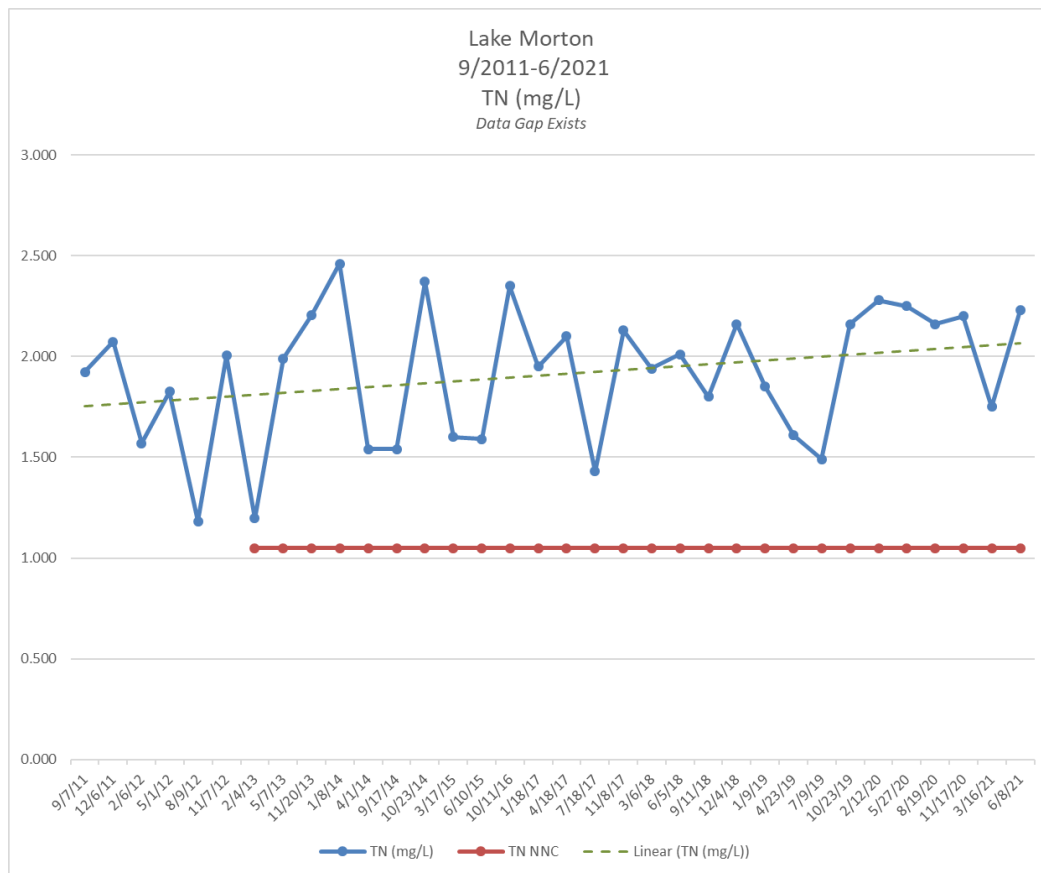


Figure 34. Total Nitrogen/Numeric Nutrient Criteria for Lake Morton

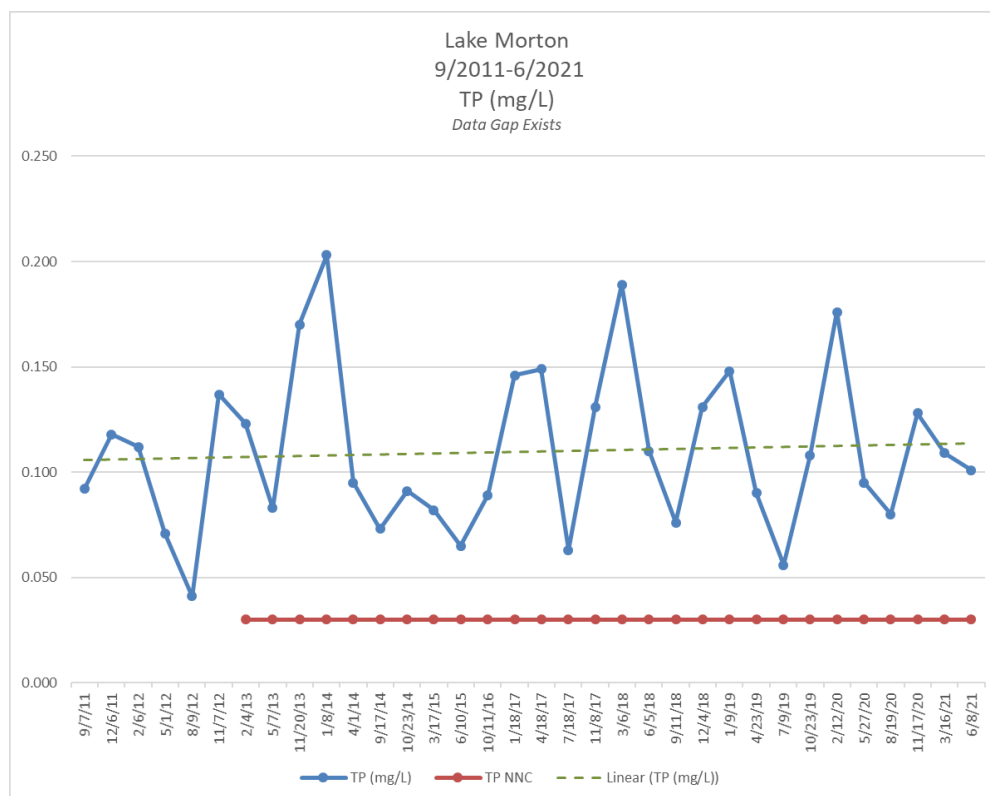


Figure 35. Total Phosphorus/Numeric Nutrient Criteria for Lake Morton

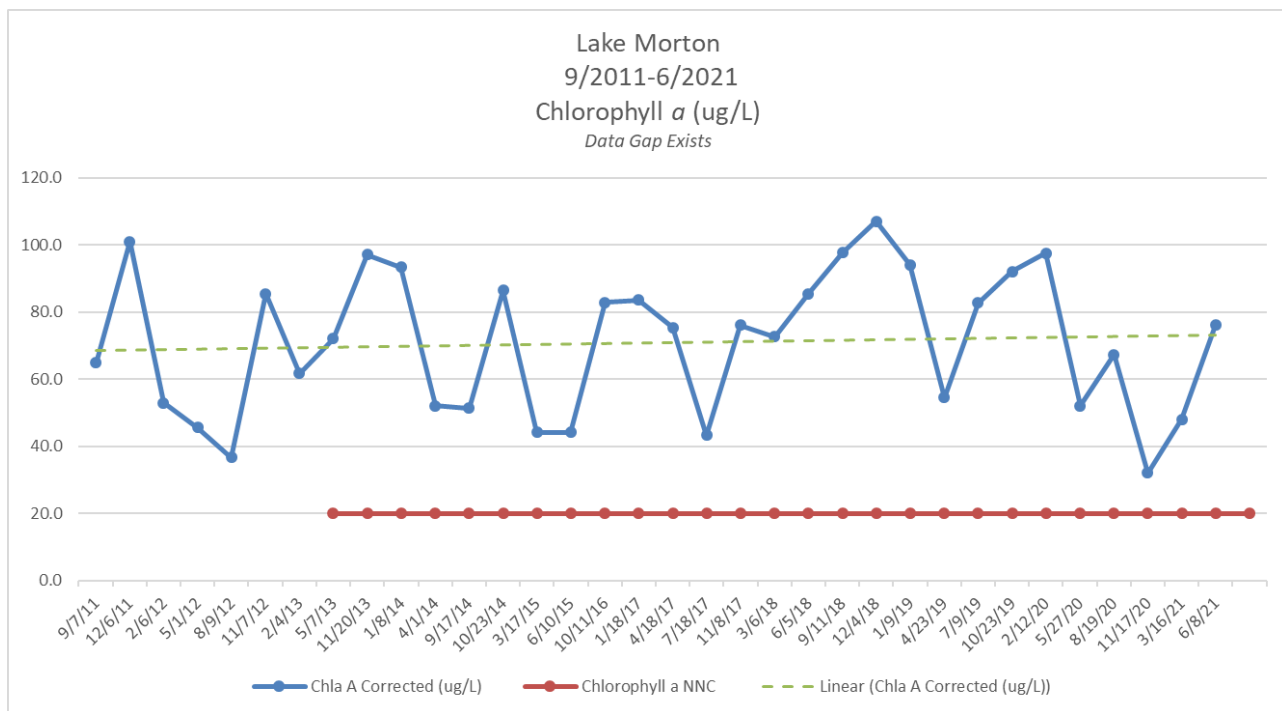


Figure 36. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Morton

Summary

Water quality monitoring results for Lake Morton report concentrations of TN, TP, and chlorophyll *a* continually exceed the NNC. The ten year trends for TN, TP, and chlorophyll *a* are all increasing.

Lake Parker

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.1
pH (std unit)	8.35
Conductivity (uS)	188.4
Dissolved Oxygen (mg/L)	8.06
Secchi Depth (m)	0.45

Table 38. Field Measurements for Lake Parker

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	9.1
Total Alkalinity (mg/L)	66.4
Total Ammonia (mg/L)	0.012
Total Kjeldahl Nitrogen (mg/L)	2.42
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	13
Total Suspended Solids (mg/L)	28

Table 39. Analytical Results for Lake Parker

Lake Parker Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation (Annual Geometric Mean))</i>	1.05	0.03	20
9/8/11	3.261	0.062	90.1
12/5/11	2.85	0.05	58.1
2/1/12	2.555	0.055	60.1
5/2/12	4.134	0.087	118.0
8/8/12	3.13	0.044	100.0
11/5/12	1.942	0.04	42.4
1/9/13	1.96	0.052	44.0
2/6/13	2.1	0.045	52.1
4/15/13	2.77	0.071	76.1
7/17/13	3.06	0.052	98.1
10/8/13	2.130	0.039	55.3
2/4/14	1.690	0.041	30.4
5/13/14	2.140	0.046	60.1
8/12/14	1.900	0.053	49.4
11/18/14	2.030	0.074	42.7
3/2/15	2.000	0.056	63.1
6/3/15	2.210	0.056	58.1
9/10/15	1.640	0.037	44.1
12/9/15	1.770	0.051	56.1
1/19/16	2.010	0.060	45.7
4/6/16	2.370	0.065	83.1
7/12/16	1.740	0.048	62.7
10/13/16	1.610	0.057	51.4
2/14/17	1.640	0.051	48.1
5/15/17	1.810	0.054	44.1
8/9/17	1.810	0.044	58.7
11/1/17	1.510	0.054	42.6
3/6/18	1.490	0.061	28.0
6/13/18	1.540	0.037	48.1
9/10/18	1.430	0.053	48.1
12/13/18	1.670	0.053	42.7
1/8/19	1.590	0.049	54.1
4/10/19	1.830	0.049	88.1
7/8/19	1.050	0.036	58.7
10/10/19	1.890	0.054	60.1
2/13/20	1.610	0.065	47.4
5/12/20	1.230	0.077	29.4
8/11/20	1.770	0.041	52.1
11/5/20	1.555	0.071	40.1
3/2/21	1.310	0.045	28.0
6/8/21	2.42	0.120	73.4

Table 40. Red font indicates quarterly result is at or exceeds the applicable NNC; Green font indicates quarterly result is below applicable NNC

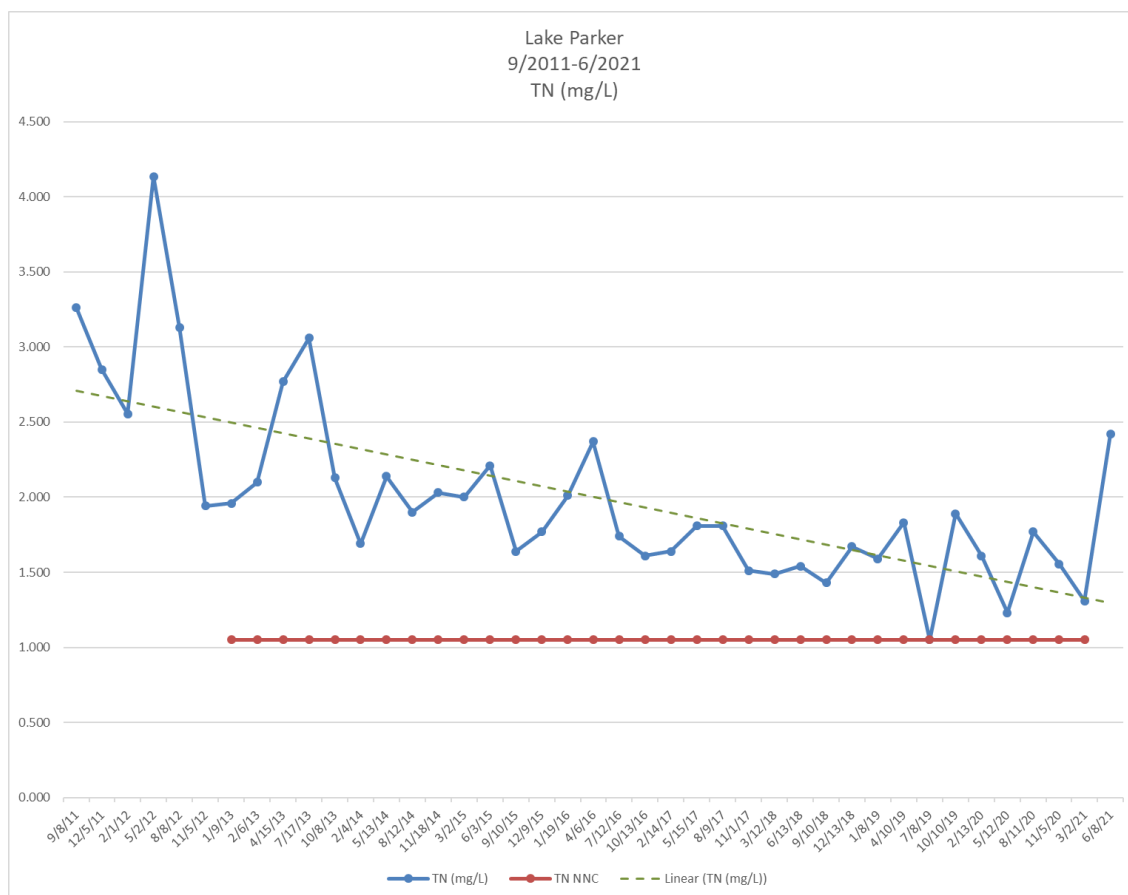


Figure 37. Total Nitrogen/Numeric Nutrient Criteria for Lake Parker

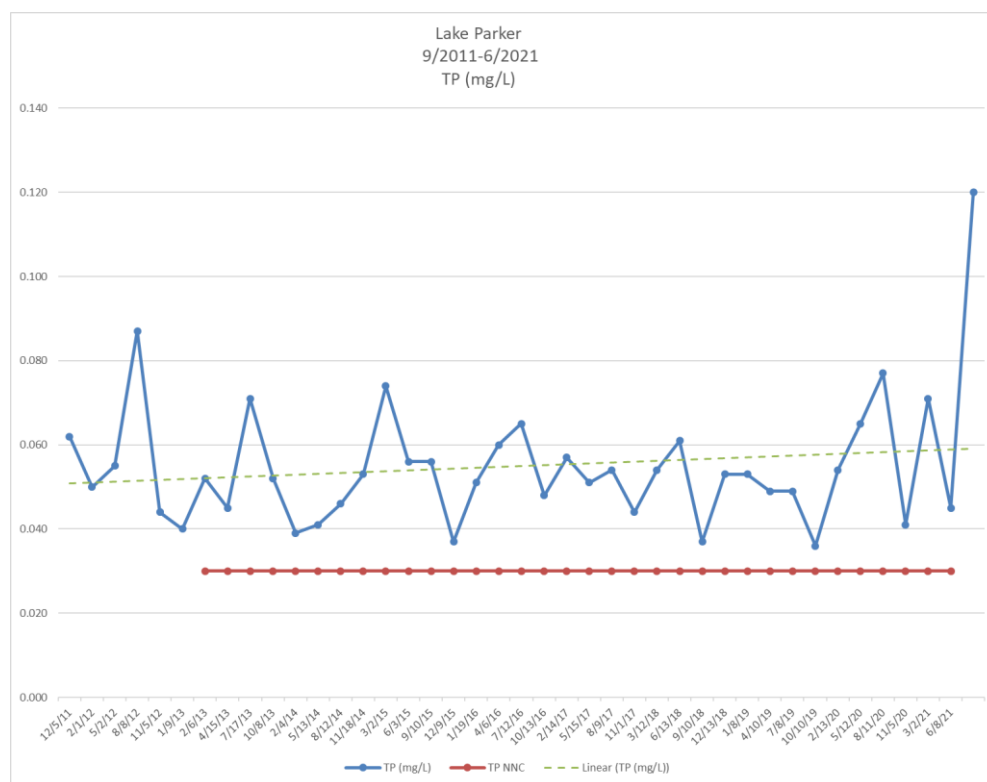


Figure 38. Total Phosphorus/Numeric Nutrient Criteria for Lake Parker

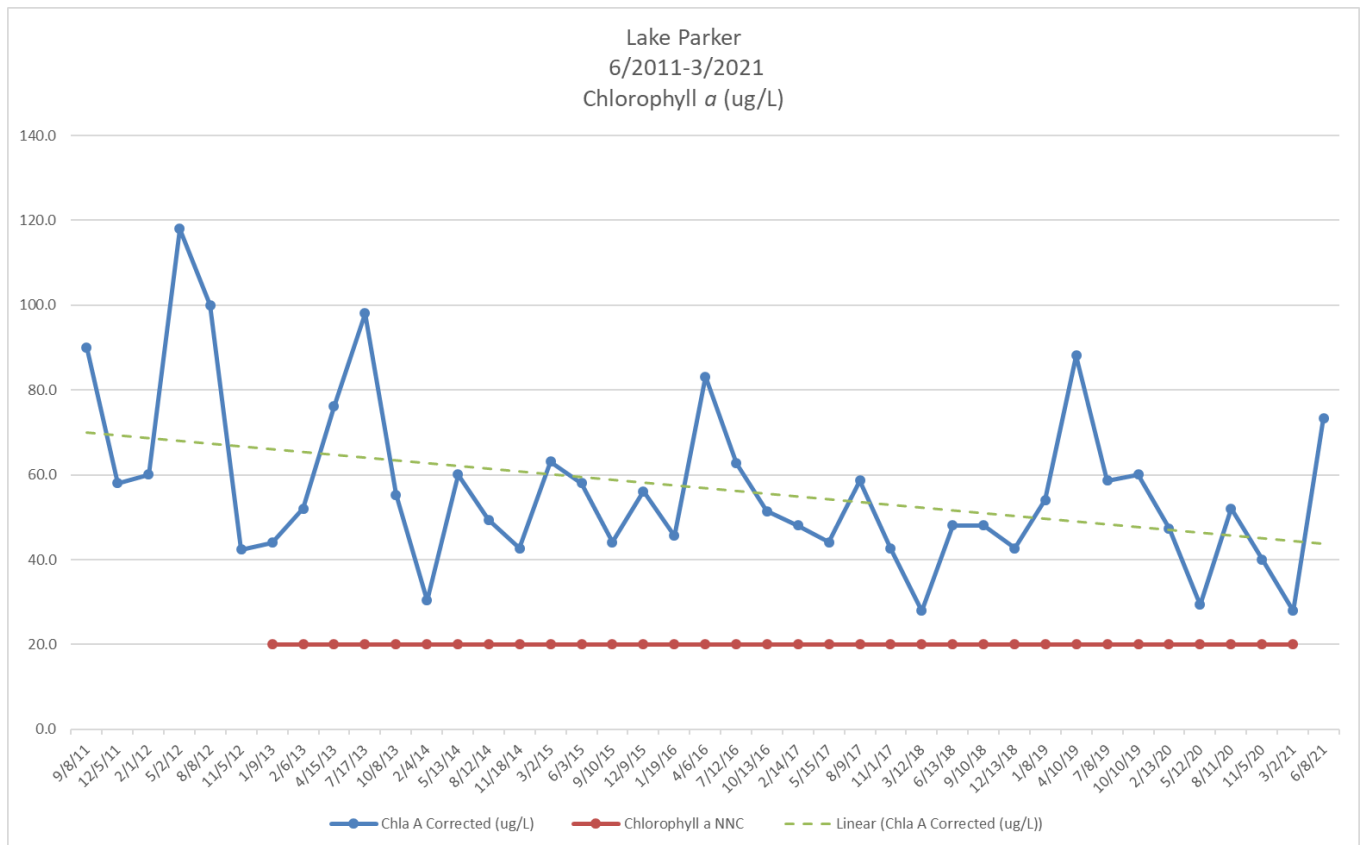


Figure 39. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Parker

Summary

Water quality monitoring results for Lake Parker show concentrations of TN, TP, and chlorophyll *a* currently exceed the NNC. The 10 year trend for TP is increasing, however, the concentrations of TN and chlorophyll *a* are decreasing.

Lake Somerset

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/1/2021
Temperature (°C)	27.8
pH (std unit)	9.28
Conductivity (uS)	212.7
Dissolved Oxygen (mg/L)	7.78
Secchi Depth (m)	0.45

Table 41. Field Measurements for Lake Somerset

Analytical Results	
Parameter (unit)	6/1/2021
Turbidity (NTU)	18
Total Alkalinity (mg/L)	74.3
Total Ammonia (mg/L)	0.055
Total Kjeldahl Nitrogen (mg/L)	2.83
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.094
Color (Pt-Co)	15
Total Suspended Solids (mg/L)	24

Table 42. Analytical Results for Lake Somerset

Somerset Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation (Annual Geometric Mean)</i>	1.05	0.03	20
9/1/11	3.1	0.285	114.0
12/6/11	2.532	0.292	100.0
3/13/12	1.98	0.326	88.1
6/12/12	1.71	0.324	61.1
9/12/12	1.88	0.302	107.0
12/11/12	1.9	0.404	125.0
1/15/13	1.54	0.295	70.4
4/10/13	1.75	0.347	71.5
7/16/13	1.83	0.254	73.9
10/14/13	2.280	0.389	102.0
2/12/14	1.780	0.296	78.8
5/7/14	1.630	0.250	73.4
8/6/14	1.810	0.202	79.5
11/5/14	2.170	0.371	120.0
3/5/15	1.960	0.324	118.0
6/17/15	1.940	0.267	84.3
9/15/15	1.870	0.326	107.0
12/7/15	1.950	0.399	78.5
1/7/16	1.740	0.433	77.7
4/11/16	1.890	0.367	66.8
7/7/16	1.690	0.205	73.6
10/3/16	1.650	0.388	80.9
2/6/17	1.810	0.371	90.5
5/9/17	2.770	0.442	130.0
8/7/17	1.530	0.292	71.4
11/7/17	1.550	0.374	62.1
3/6/18	2.180	0.378	132.0
6/12/18	1.61	0.246	65.7
9/10/18	1.690	0.288	86.5
12/11/18	1.930	0.389	82.1
1/9/19	1.590	0.317	76.1
4/3/19	1.840	0.319	83.3
7/2/19	0.890	0.125	93.5
10/8/19	2.150	0.335	96.1
2/17/20	2.140	0.297	90.1
5/11/20	2.510	0.400	86.1
8/4/20	1.920	0.246	62.8
11/2/20	1.360	0.285	40.1
3/1/21	1.860	0.308	68.5
6/1/21	2.83	0.351	113

Table 43. Red font indicates quarterly result is at or exceeds the applicable NNC; Green shaded indicates quarterly result is below the applicable NNC

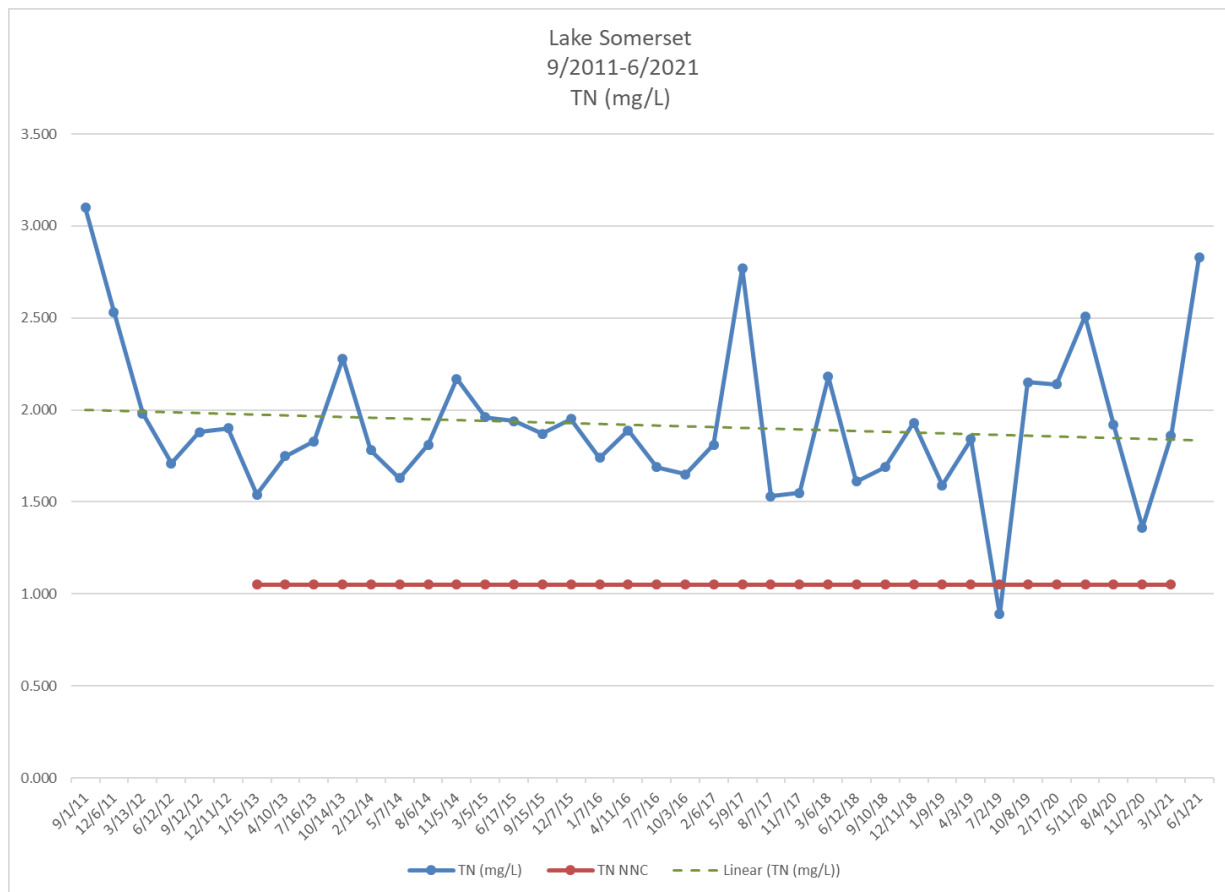


Figure 40. Total Nitrogen/Numeric Nutrient Criteria for Lake Somerset

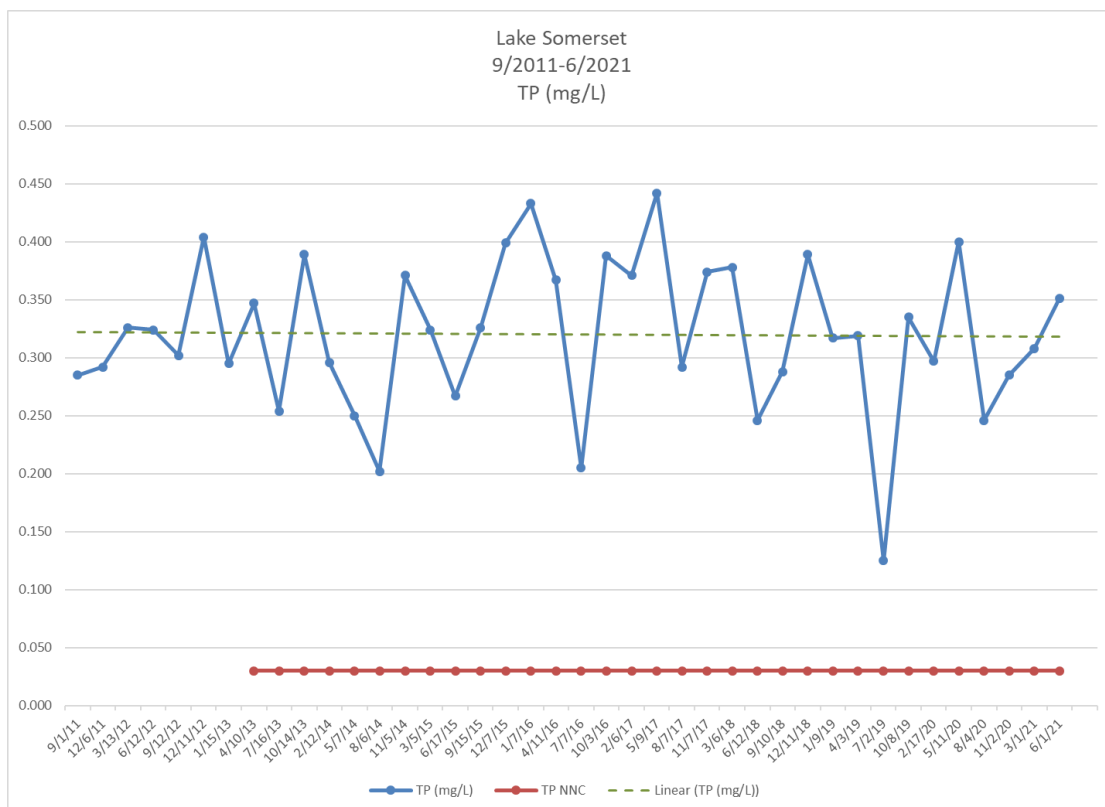


Figure 41. Total Phosphorus/Numeric Nutrient Criteria for Lake Somerset

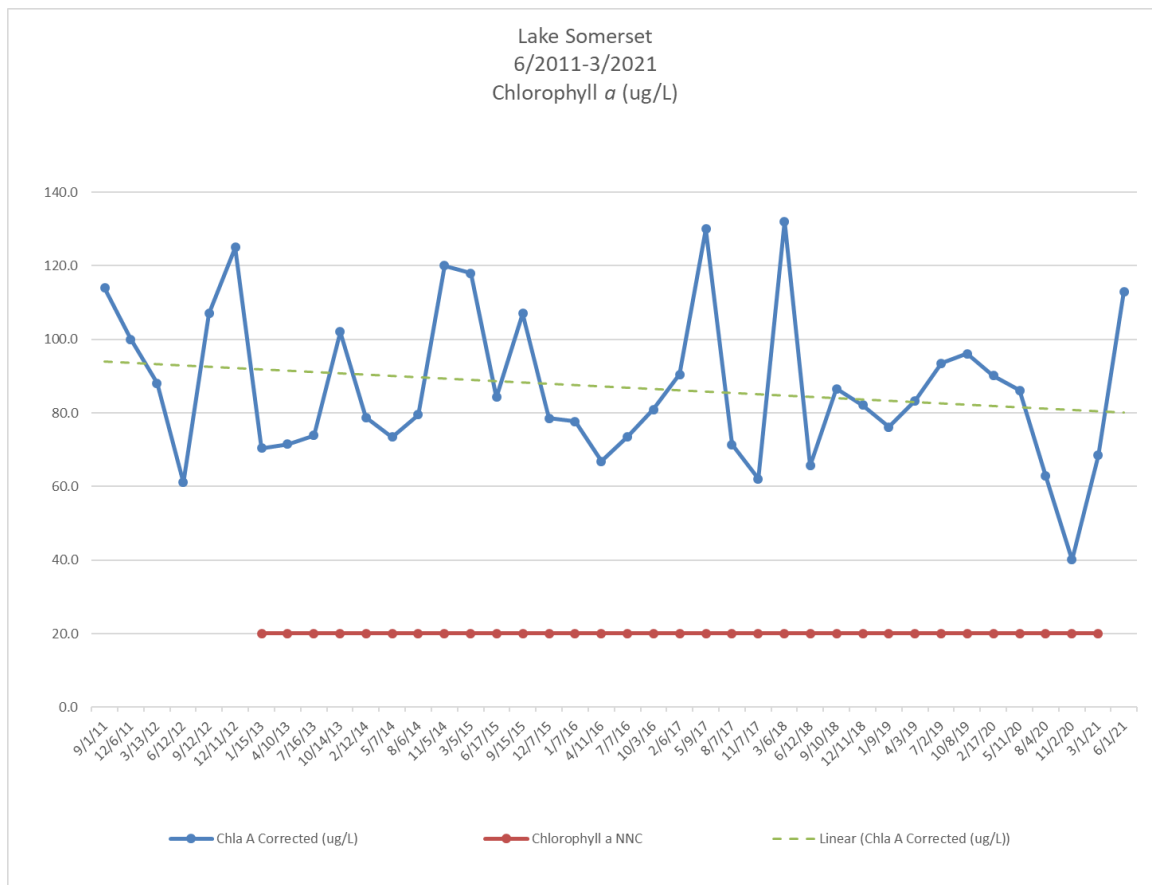


Figure 42. Chlorophyll *a*/Numeric Nutrient Criteria for Lake Somerset

Summary

Lake Somerset monitoring results indicate the concentrations for TN, TP, and chlorophyll *a* exceed the NNC threshold. The ten year trend for TN and chlorophyll *a* is decreasing while the trend for TP is level.

Lake Wire

Surface Water Quality Monitoring Results

Field Measurements	
Parameter (unit)	6/8/2021
Temperature (°C)	28.70
pH (std unit)	8.28
Conductivity (uS)	108.5
Dissolved Oxygen (mg/L)	7.43
Secchi Depth (m)	2.7

Table 44. Field Measurements for Lake Wire

Analytical Results	
Parameter (unit)	6/8/2021
Turbidity (NTU)	1.4
Total Alkalinity (mg/L)	44.0
Total Ammonia (mg/L)	0.022
Total Kjeldahl Nitrogen (mg/L)	0.645
Nitrate-Nitrite (mg/L)	0.010
Ortho Phosphorus (mg/L)	0.010
Color (Pt-Co)	13
Total Suspended Solids (mg/L)	6.0

Table 45. Analytical Results for Lake Wire

Lake Wire Ten Year Nutrient Data Summary

Sampling Date	TN (mg/L)	TP (mg/L)	Chlorophyll <i>a</i> corr (ug/L)
<i>Numeric interpretations of narrative nutrient criteria as per FAC 62-302.531</i>			
<i>Current Applicable NNC (Minimum Calculated Numeric Interpretation (Annual Geometric Mean))</i>	1.91	0.09	20
9/8/11	0.521	0.042	3.00
12/7/11	0.517	0.019	3.00
1/4/12	3.882	0.025	3.00
4/2/12	1.425	0.030	11.20
7/10/12	0.503	0.021	3.00
10/8/12	0.480	0.027	6.21
1/8/13	0.427	0.029	3.24
4/2/13	0.632	0.040	3.00
10/2/13	0.819	0.028	3.00
1/7/14	0.510	0.033	3.00
4/2/14	0.510	0.033	3.00
9/17/14	0.560	0.031	3.61
10/23/14	0.580	0.028	5.61
3/17/15	0.550	0.034	4.81
6/9/15	0.480	0.019	3.00
9/15/15	0.450	0.023	4.81
12/8/15	0.510	0.023	3.00
1/1/16	NS	NS	NS
4/1/16	NS	NS	NS
7/1/16	NS	NS	NS
10/10/16	0.42	0.031	3.00
1/18/17	0.39	0.019	3.00
4/19/17	0.49	0.019	3.00
7/19/17	0.53	0.021	3.00
11/8/17	0.55	0.021	8.81
3/6/18	0.49	0.026	4.01
6/5/18	0.44	0.022	3.00
9/11/18	0.56	0.033	4.81
12/4/18	0.59	0.031	3.20
1/9/19	0.53	0.040	3.00
4/23/19	0.52	0.022	33.60
7/9/19	0.50	0.032	10.40
10/23/19	0.42	0.021	3.00
2/12/20	0.43	0.026	3.00
5/27/20	0.620	0.029	4.01
8/19/20	0.510	0.037	3.20
11/17/20	0.460	0.029	3.00
3/16/21	0.480	0.027	3.10
6/8/21	0.65	0.039	10.4

Table 46. NS=Not Sampled; **Red font** indicates quarterly result is at or exceeds the applicable NNC; **Green font** indicates quarterly result is below max annual geometric mean

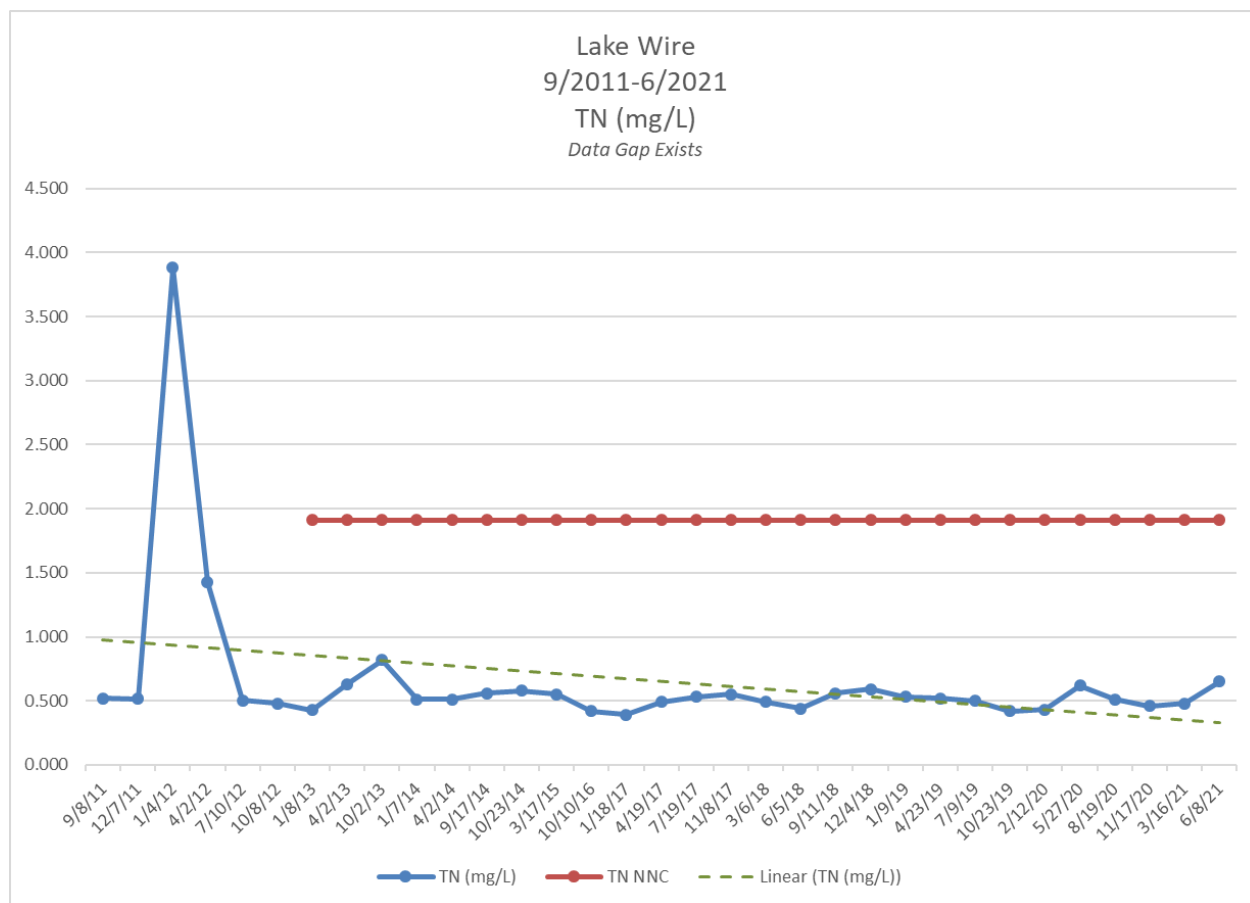


Figure 43. Total Nitrogen/Numeric Nutrient Criteria for Lake Wire

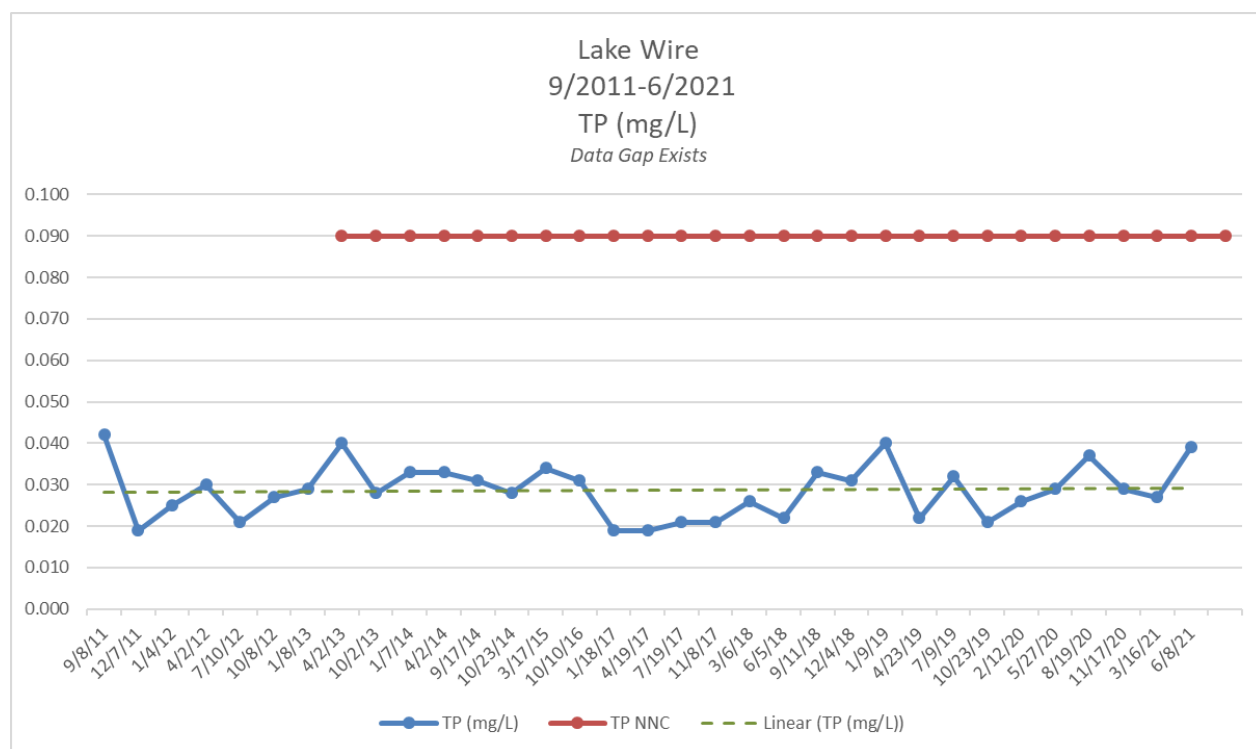


Figure 44. Total Phosphorous/Numeric Nutrient Criteria for Lake Wire

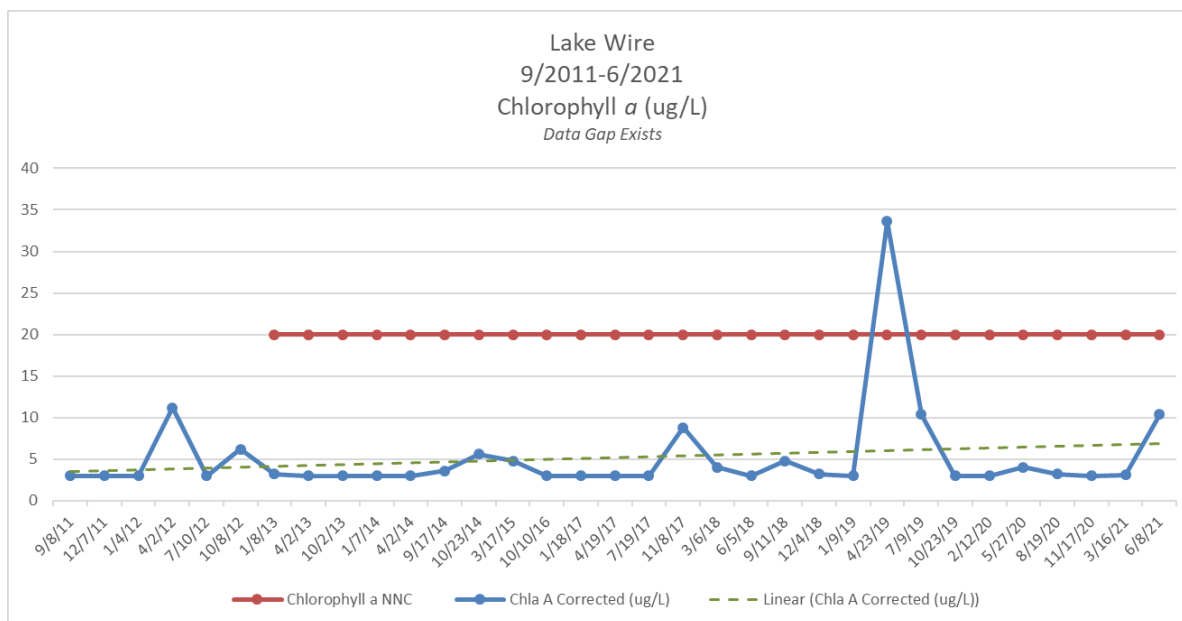


Figure 45. Chlorophyll-*a*/Numeric Nutrient Criteria for Lake Wire

Summary

Lake Wire water quality monitoring results indicate that concentrations of TN, TP, and chlorophyll *a* are far below the NNC levels. The ten year trend shows that the concentration of TN is decreasing. The same trend line period for TP is nearly level and chlorophyll *a* reflects an increase.