PROPOSED

TOTAL MAXIMUM DAILY LOAD (TMDL)

For

Nutrients and Dissolved Oxygen

In

East Lake Outlet/Bellows Lake Outlet

(WBID 1579)

and

East Lake/Bellows Lake

(WBID 1579A)

Prepared by:

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September 30, 2009

Acknowledgments

EPA would like to acknowledge that the contents of this report and the total maximum daily load (TMDL) contained herein were developed by the Florida Department of Environmental Protection (FDEP). Many of the text and figures may not read as though EPA is the primary author for this reason, but EPA is officially proposing the TMDL for Nutrients and Dissolved Oxygen for East Lake Outlet and East Lake and soliciting comment. EPA is proposing this TMDL in order to meet consent decree requirements pursuant to the Consent Decree entered in the case of Florida Wildlife Federation, et al. v. Carol Browner, et al., Case No. 98-356-CIV-Stafford. EPA will accept comments on this proposed TMDL for 60 days in accordance with the public notice issued on September 30, 2009. Should EPA be unable to approve a TMDL established by FDEP for the 303(d) listed impairment addressed by this report, EPA will establish this TMDL in lieu of FDEP, after full review of public comment.

This TMDL analysis could not have been accomplished without significant contributions from staff in Hillsborough County, the Florida Department of Environmental Protection's Southwest District Office, and the Watershed Evaluation and TMDL Section.

Editorial assistance provided by Jan Mandrup-Poulsen and Linda Lord.

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Florida Department of Environmental Protection, Bureau of Watershed Restoration

TMDL Program

http://www.dep.state.fl.us/water/tmdl/index.htm

Identification of Impaired Surface Waters Rule

http://www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf

STORET Program

http://www.dep.state.fl.us/water/storet/index.htm

2008 Integrated Report

http://www.dep.state.fl.us/water/tmdl/docs/2008_Integrated_Report.pdf

Criteria for Surface Water Quality Classifications

http://www.dep.state.fl.us/legal/rules/shared/62-302t.pdf

Basin Status Report for the Tampa Bay Basin

http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

Basin Water Quality Assessment Report for the Tampa Bay Basin

http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

U.S. Environmental Protection Agency

Region 4: Total Maximum Daily Loads in Florida

http://www.epa.gov/region4/water/tmdl/florida/

National STORET Program

http://www.epa.gov/storet/

Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for nutrients and dissolved oxygen (DO) for the Bellows Lake Outlet (WBID 1579) watershed and for nutrients in Bellows Lake (WBID 1579A) in the Tampa Bay Basin. Bellows Lake Outlet was verified as impaired for nutrients and DO and Bellows Lake was verified as impaired for nutrients by elevated Trophic State Index (TSI) and therefore were included on the Verified List of impaired waters for the Tampa Bay Basin that was adopted by Secretarial Order on May 19, 2009. These TMDLs establish the allowable loadings to both Bellows Lake and Bellows Lake Outlet that would restore the waterbodies so that they meet the applicable water quality criteria for nutrients and DO.

1.2 Identification of Waterbody

There is some question as the actual identification (name) of the affected waterbodies. The name "Bellows" is the name associated with the impaired waterbodies in the FDEP database and geographic information system (GIS). However, Hillsborough County (County) documents refer to the lake as East Lake (Lake) and the outlet channel as the East Lake Outfall (stream). The civic association that participates in LAKEWATCH data collection is the East Lake Park Civic Association. The park located along the shore of the lake is called East Lake Park. The County Stormwater Management Master Plan is for the East Lake Area. From this point forward in the document, Bellows Lake will be referred to as either East Lake or Lake, and Bellows Lake Outlet will be termed either East Lake Outfall or stream. East Lake is located in Central Hillsborough County (**Figure 1.1**). The watershed is primarily urban and drains to the Tampa By-Pass Canal and then to Tampa Bay. The basin is generally bounded on the north by the Harney Canal, to the east by the Tampa By-Pass Canal, along the south side by Columbus Drive, and the west side by the C.S.X. Railroad and 50th/56th Street. Information about these waterbodies is available in the Basin Status Report for the Tampa Bay Basin (Florida Department of Environmental Protection [Department], 2001). Significant additional information is contained in the "East Lake Area Stormwater Management Master Plan" (Plan) published by the County (September 1999). The Plan provides detailed information on soils, land uses (current and future), water routing through more than 200 subbasins and the calculation of water budgets and loadings for various future scenarios possible within the East Lake Area. Copies of this report can be obtained from the Hillsborough County website:

ftp://ftp.hillsboroughcounty.org/pwe/pub/masterplan/East_lake/

The lake is a natural feature, approximately 98 acres in size and receives drainage from 1127 acres. The Lake is up to 8 feet deep, with a mean depth of 5.45 ft and an annual average volume of 536 acre-feet. Outflow from the lake is controlled by two non-adjustable control structures in the southeast corner of the lake. A small island (0.79 acres) is located in the northeast corner of the lake (**Figures 1.2 and 1.3**). The island was either created by spoil from the creation of the two arms of the lake (**Figure 1.2**) or was a remnant upland site left after the two arms were created. This island (called Bird Island in the Plan) is reported to be owned by the Tampa Audubon Society.

East Lake Outfall (Stream), starts at the outlet from East Lake and flows under Interstate- 4, through box culverts to the southeast. Downstream of the I-4 crossing are two weirs, these structures control water level in East Lake and discharge to a large ditch that conveys water towards Orient Road. After passing Orient Road, the flow is joined by the discharge from the Fairgrounds Outfall South System. Flow continues, generally southeast to just past Martin Luther King Boulevard, at this point the stream channel becomes deep with steep side slopes and with little to no stormwater management systems in place. There is a control structure at the final discharge location into the Tampa By-Pass Canal.

For assessment purposes, the Department has divided the Tampa Bay Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. East Lake is assigned to WBID 1579A and East Lake Outfall to WBID 1579 (**Figure 1.2**). **Figure 1.4** depicts the watershed for the East Lake Area as contained in the Plan. From this figure, it can be seen that the actual watershed drains a larger area than is represented by the WBIDs.

1.3 Background

This report was developed as part of the Department's watershed management approach for restoring and protecting state waters and addressing TMDL Program requirements. The watershed approach, which is implemented using a cyclical management process that rotates through the state's 52 river basins over a 5-year cycle, provides a framework for implementing the TMDL Program–related requirements of the 1972 federal Clean Water Act and the 1999 Florida Watershed Restoration Act (FWRA) (Chapter 99-223, Laws of Florida).

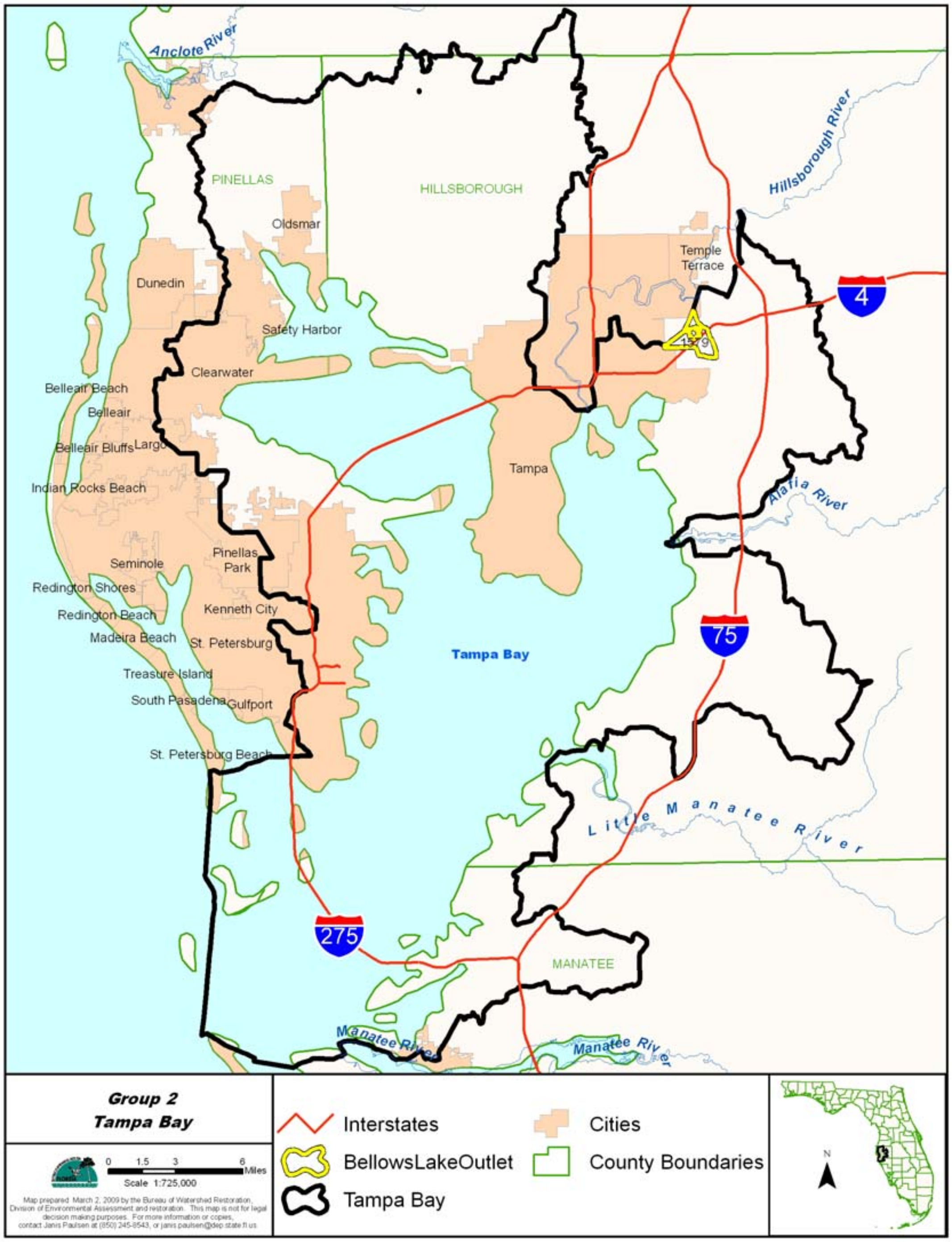


Figure 1.1 Location of East (Bellows) Lake and East (Bellows) Lake Outfall WBIDs in Hillsborough County and Major Geopolitical Features in the Area

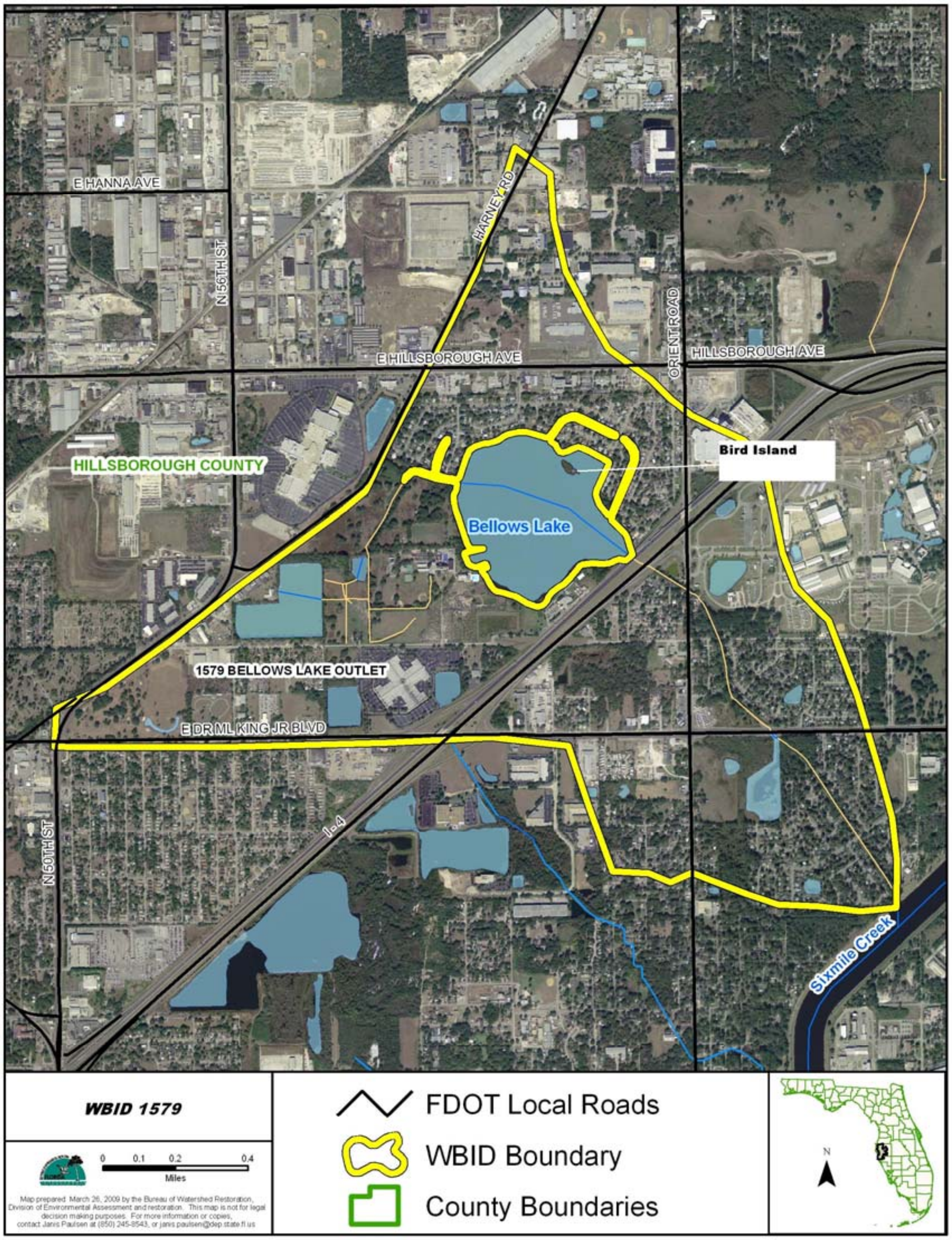
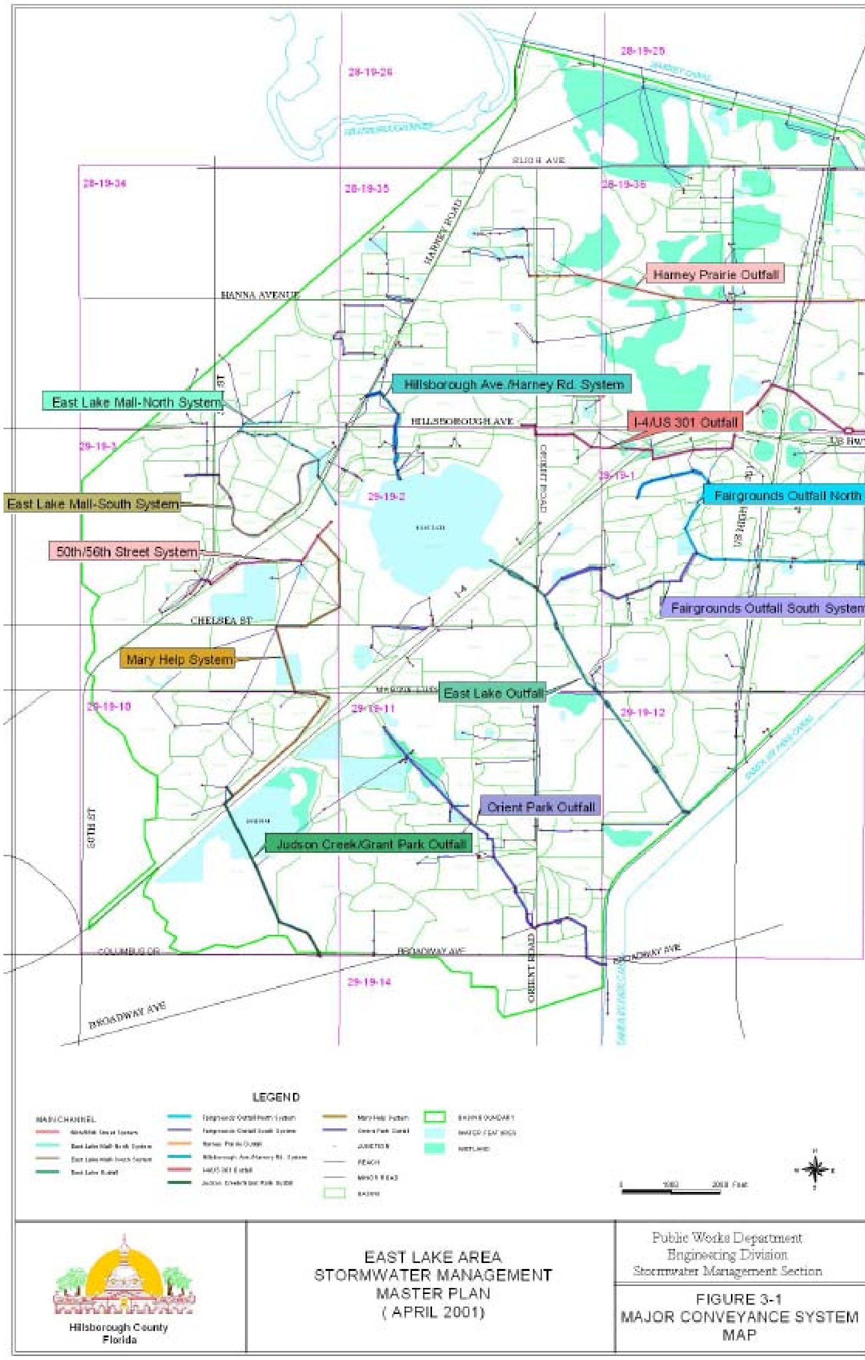


Figure 1.2 Location of the East (Bellows) Lake and East (Bellows) Lake Outfall (WBIDs 1579A, 1579) boundaries and Bird Island

Figure 1.3 Bird Island (~0.8 acres) within East Lake (WBID 1579A)



* From the Plan

Figure 1.4 Location of Drainage Network and Model Catchments for the East Lake Area

A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting their water quality standards. They provide important water quality restoration goals that will guide restoration activities.

This TMDL Report will be followed by the development and implementation of a Basin Management Action Plan, or BMAP, designed to reduce the amount of nutrients and increase the DO that caused the verified impairment of East Lake and East Lake Outfall. These activities will depend heavily on the active participation of the Southwest Florida Water Management District (SWFWMD), Hillsborough County, local governments, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act requires states to submit to the U.S. Environmental Protection Agency (EPA) lists of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant causing impairment of listed waters on a schedule. The Department has developed such lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin, referred to as the Verified List, is also required by the FWRA (Subsection 403.067[4], Florida Statutes [F.S.]); the state's 303(d) list is amended annually to include basin updates.

Florida's 1998 303(d) list included 47 waterbodies in the Tampa Bay Basin. However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rulemaking process, the Environmental Regulation Commission adopted the new methodology as Rule 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001; the rule was modified in 2006 and 2007.

East Lake Outfall was placed on the 1998 303D list after receiving a "fair" rating from a biological assessment in 1993. Based on EPA practices, a rating of fair was sufficient for the waterbody to be determined as impaired and the stream was placed on the 1998 303D list for nutrients and DO. East Lake is not on the 1998 303d list, but was verified as impaired for nutrients in the current assessment cycle.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the East Lake and East Lake Outfall watersheds and verified the impairments during the second cycle of the TMDL program. **Table 2.1** (East Lake) and **Table 2.2** summarize the cause of impairment based on water quality data collected during the verification period (January 1, 2000, through June 30, 2007). The projected year for the [1998 303(d) listed] DO and nutrient TMDLs for the stream was 2008, but the Settlement Agreement between EPA and Earthjustice, which drives the TMDL development schedule for waters on the 1998 303(d) list, allows an additional nine months to complete the TMDLs. As such, these TMDLs must be adopted and submitted to EPA by September 30, 2009.

The verified impairments were based on data collected by the Southwest Florida Water Management District and the DEP Southwest District. The WBID location and the STORET stations are shown in **Figure 2.1**.

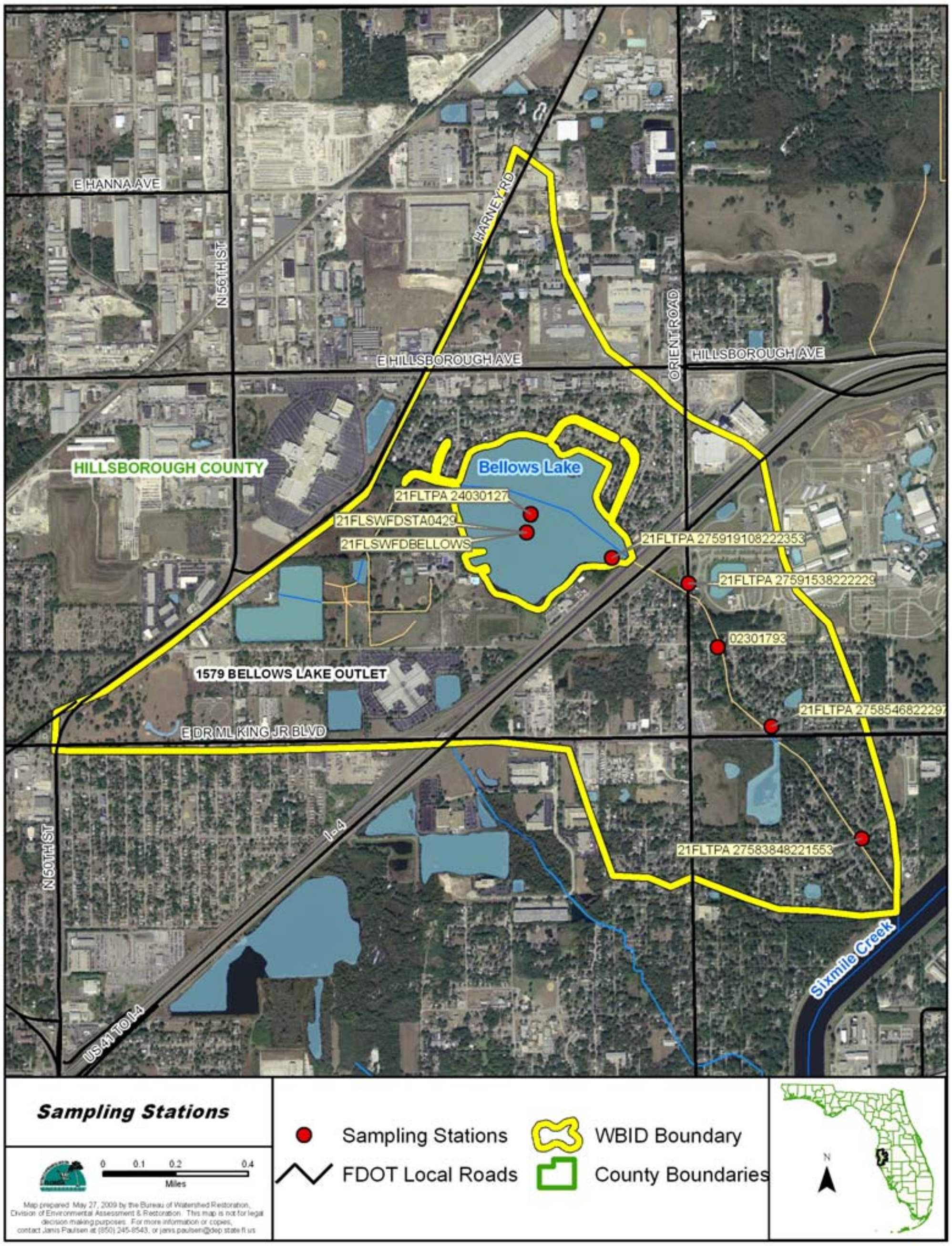


Figure 2.1 Location of Water Quality and Flow Stations for East (Bellows) Lake WBID 1579A and East (Bellows) Lake Outfall WBID 1579

Table 2.1 Verified Impairments for East Lake (WBID 1579A)

WBID	Waterbody Segment	Waterbody Type	Waterbody Class	1998 303(d) Parameters of Concern	Parameter Causing Impairment
1579A	East Lake	Fresh	III	N/A	TSI = 70.3

*NA – Not applicable

Annual average concentrations for the year of impairment (2006) corrected chlorophyll a (CChl a, 50.79 µg/L, total nitrogen (TN) 2.13 mg/L, and total phosphorus (TP) of 0.082 mg/L resulted in a trophic state index (TSI) of 70.3.

The TSI is calculated based on concentrations of TP, TN, and Chl a as follows:

$CHLA_{TSI} = 16.8 + 14.4 * LN(Chl\ a)$ Chl *a* in µg/L
$TN_{TSI} = 56 + 19.8 * LN(N)$ N in mg/L
$TN2_{TSI} = 10 * [5.96 + 2.15 * LN(N + 0.0001)]$
$TP_{TSI} = 18.6 * LN(P * 1000) – 18.4$ P in mg/L
$TP2_{TSI} = 10 * [2.36 * LN(P * 1000) – 2.38]$

If $N/P > 30$, *then* $NUTR_{TSI} = TP2_{TSI}$
If $N/P < 10$, *then* $NUTR_{TSI} = TN2_{TSI}$
if $10 < N/P < 30$, *then* $NUTR_{TSI} = (TP_{TSI} + TN_{TSI})/2$

$TSI = (CHLA_{TSI} + NUTR_{TSI})/2$ (TSI has no units)

Table 2.2 Verified Impairments for East Lake Outfall (WBID 1579)

WBID	Waterbody Segment	Waterbody Type	Waterbody Class	1998 303(d) Parameters of Concern	Parameter Causing Impairment
1579	East Lake Outfall	Fresh	III	DO	12 exceedances out of 22 results
1579	East Lake Outfall	Fresh	III	Nutrients	Annual Average CChla Exceeded 20 µg/L in 2005

Rainfall:

Rainfall data for the period 1992 through 2007 was obtained for the NOAA station closest to East Lake. This station is located within the City of Tampa at the Tampa International Airport (TIA), about 9.2 miles west of East Lake. **Figure 2.2** depicts the daily rainfall for this period.

Table 2.3 Annual Average Rainfall at TIA

Year	Rain (inches)
1992	35.0
1993	37.5
1994	47.2
1995	54.1
1996	49.4
1997	67.7
1998	55.4
1999	34.3
2000	29.9
2001	39.8
2002	62.1
2003	52.0
2004	59.3
2005	39.0
2006	56.6
2007	42.0
AllData Average	47.6
VP+ Data Average	47.6

Table 2.3 and **Figure 2.4** depict the annual average rainfall from 1992 through 2007. Based on this period of record (POR), the annual average is 47.6 inches. This is slightly less than the long term annual average at this gage of 52 inches/year. During the verified period, the years 2000 (29.9 in), 2001 (39.8 in), and 2005 (39.0 in) had lower than average rainfall, with 2000 as the least rainfall in the POR. The years 2002 (wettest year, 62.1 in), 2004 (59.6 in), and 2006 (56.6 in) were wetter than average. Therefore, the verified period contained a good mix of wet and dry conditions.

Table 2.4 Monthly Average Rainfall

Month	AllData Rain (in)	VP+ Rain (in)
Jan	2.4	1.5
Feb	2.9	3.0
Mar	2.3	2.1
Apr	2.5	1.8
May	1.3	1.3
Jun	7.4	9.4
Jul	6.8	7.0
Aug	8.3	8.5
Sep	6.8	7.0
Oct	2.4	1.7
Nov	1.2	1.2
Dec	3.1	3.1
Average	4.0	4.0

Table 2.4 and **Figure 2.4** present the monthly average rainfall. It is clear from these data that June, July, August, and September are much wetter than other months of the year and the wet season was wetter and the dry season drier during the verified period than for the POR.

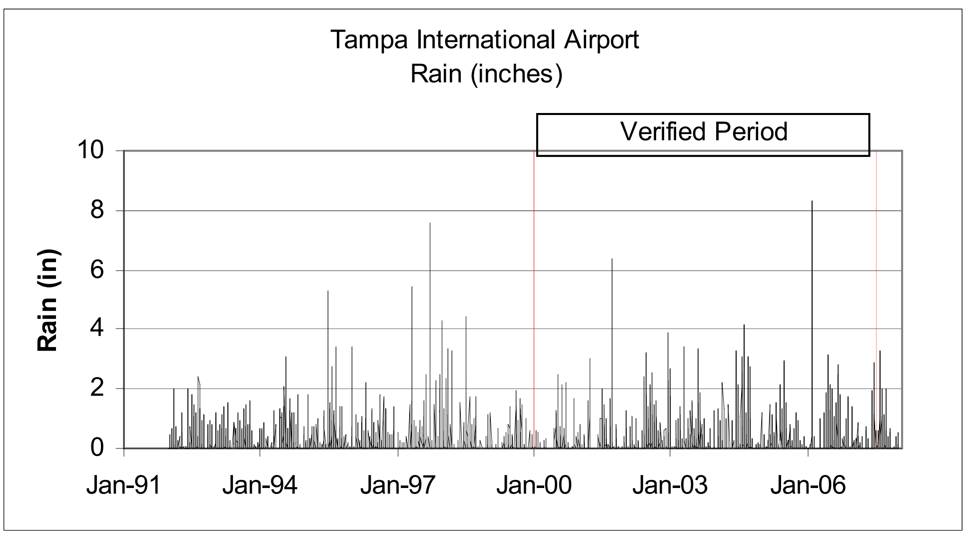


Figure 2.2 Daily Rainfall (inches) 1992-2007

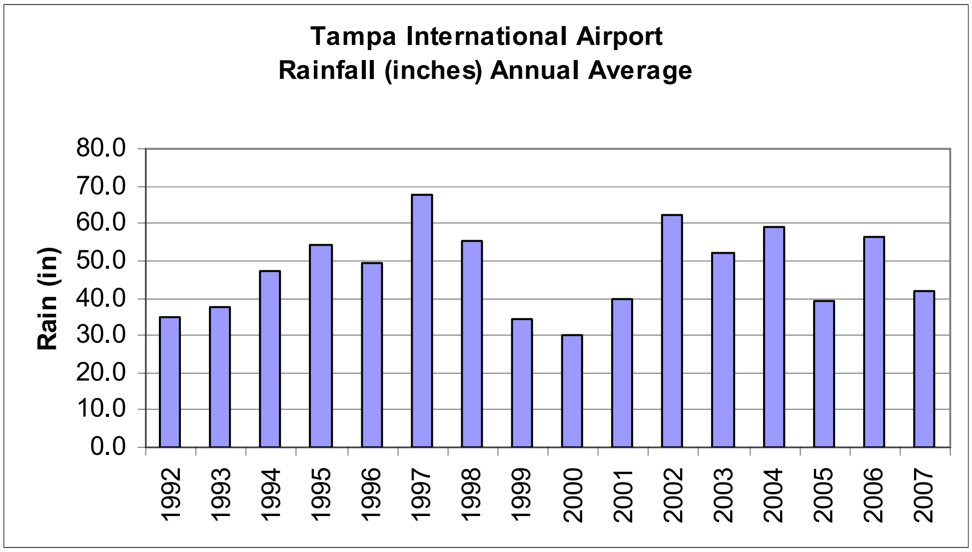


Figure 2.3 Annual Average Rainfall

From **Figure 2.3**, it can be seen that the first year of the verified period (2000) was at the end of three years of declining rainfall. The year 2002 (at 62.1 inches of rain) was the wettest year in the verified period.

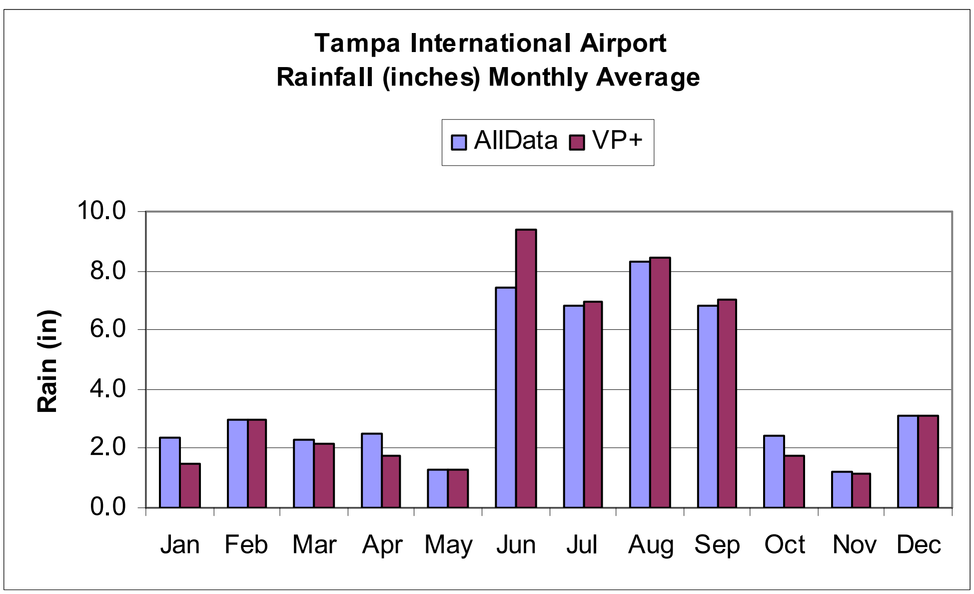


Figure 2.4 Monthly Average Rainfall

Color:

Table 2.5 Color East Lake (1579A)

East Lake Color (PCU)	Period of Record	Count	Min	25th Percentile	Average (a)	Median	75th Percentile	Max
AllData	7/95, 1/96, 8/01, 2/06-11/06, 2/07	28	15.0	55.0	58.4	60.0	80.0	80.0
AllData-VerifiedP (a)	8/01, 2/06-11/06, 2/07	26	15.0	60.0	61.3	60.0	80.0	80.0
SFWMD-1 *	2/06, 8/06, 2/07	4	20.0	27.5	30.0	30.0	32.5	40.0
SFWMD-2 *	8/01	1	15.0	15.0	15.0	15.0	15.0	15.0
SFWMD-3 *	7/95, 1/96	2	20.0	20.0	20.0	20.0	20.0	20.0
TPA-C	2/06 - 11/06	11	60.0	60.0	68.2	60.0	80.0	80.0
TPA-O	2/06 - 11/06	10	60.0	60.0	71.0	75.0	80.0	80.0

* True Color (filtered sample)
(a) Straight arithmetic average

Table 2.6 Color East Lake Outfall (1579)

East Lake Outfall Color (PCU)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	8/04; 2/05-11/05	23	60	60	72.2	60	90	100
AllData-VerifiedP (a)	8/04; 2/05-11/05	23	60	60	72.2	60	90	100
21FLGW22067	8/04	1	60	60	60.0	60	60	60
TP380	2/05-11/05	8	60	60	67.5	60	65	100
TP381	2/05-11/05	7	60	60	71.4	60	80	100
TP382	2/05-11/05	7	60	60	80.0	80	100	100

(a) Straight arithmetic average

Table 2.5 and **Figure 2.5** depict the lake data for color. From these data (excluding data for true color) the color in the lake varies between 60 and 80 PCU, with an average of 69.6 PCU.

Table 2.6 and **Figure 2.6** depict the stream data for color. From these data, the color in the stream varies between 60 and 100 PCU, with an average of 72.2 PCU. Although data are limited (and the stream data is from 2006 while the lake data is from 2005), it appears that average color in the stream is higher than the lake and that it increases in a downstream direction (stations labeled TPXXX in the stream Tables are arranged from upstream to downstream order).

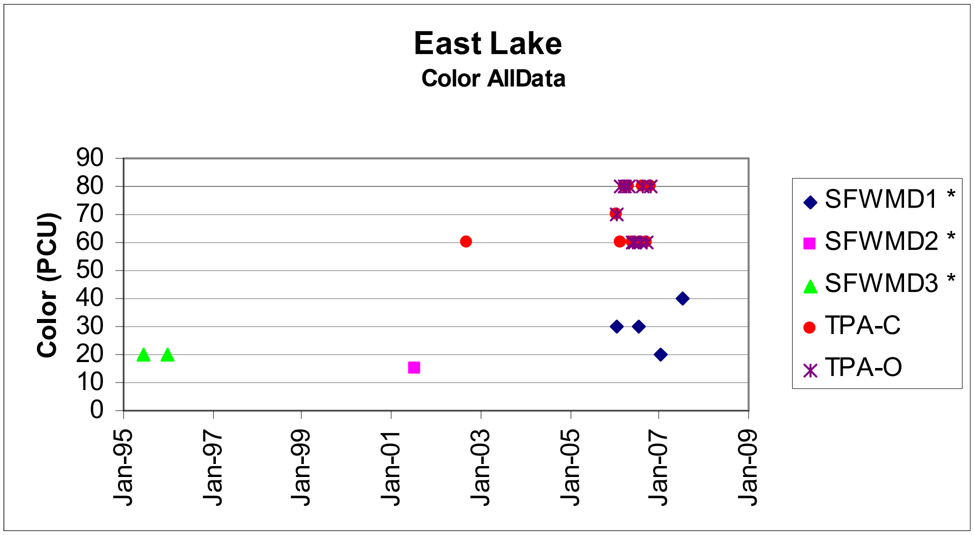


Figure 2.5 Color AllData East Lake

* = True (filtered) color

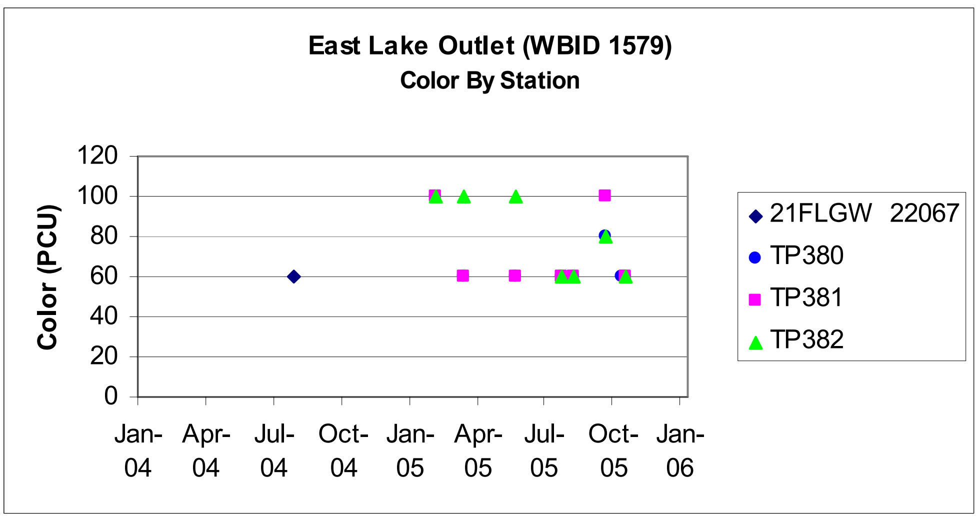


Figure 2.6 Color AllData East Lake Outfall

Dissolved Oxygen:

Table 2.7 Dissolved Oxygen East Lake (1579A)

East Lake Dissolved Oxygen (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	7/95, 1/96, 8/01, 2/06-12/06,2/07	31	0.66	8.22	9.33	9.81	10.56	13.90
AllData-VerifiedP (a)	8/01, 2/06-12/06, 2/07	27	0.66	7.97	9.26	9.81	10.49	13.90
SFWMD-1	2/06, 8/06, 2/07, 8/07	7	0.66	9.61	8.94	9.96	10.45	11.81
SFWMD-2	8/01	1	11.19	11.19	11.19	11.19	11.19	11.19
SFWMD-3	7/95, 1/96	4	8.15	8.25	9.77	9.78	11.30	11.35
TPA-C	2/06 - 12/06	8	7.40	9.02	10.00	9.99	10.48	13.90
TPA-O	2/06 - 12/06	11	6.41	7.20	8.76	8.96	9.91	12.95

(a) Straight arithmetic average

Table 2.8 Dissolved Oxygen East Lake Outfall (1579)

East Lake Outfall DO (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	8/04; 2/05-11/05; 11/08-12/08; 1/09	43	1.51	2.97	4.40	4.70	5.64	8.11
AllData-VerifiedP (a)	8/04; 2/05-11/05	23	1.51	3.19	4.52	4.97	5.64	7.41
21FLGW22067	8/04	1	5.66	5.66	5.66	5.66	5.66	5.66
TP380	2/05-11/05; 11/08-12/08; 1/09	14	1.51	3.38	4.20	4.73	5.31	5.84
TP381	2/05-11/05; 11/08-12/08; 1/09	13	2.25	2.80	3.80	3.23	4.92	7.19
TP382	2/05-11/05; 11/08-12/08; 1/09	15	2.15	3.08	5.03	5.62	6.45	8.11

(a) Straight arithmetic average

Table 2.7 and **Figure 2.7** depict the lake data for DO. From these data, the DO in the lake varies between < 1.0 mg/L and 13.9 mg/L, with an average during the verified period (VP) of 9.26 mg/L. DO is generally higher at the station in the middle of the lake as opposed to near the outlet.

Table 2.8 and **Figure 2.8** depict the stream data for DO. From these data, the DO in the stream varies between 1.5 mg/L and 8.11 mg/L, with an average of 4.40 mg/L. Although data are limited (and the stream data is from 2006 while the lake data is from 2005), it appears that average DO in the stream is significantly less than the lake. Additionally, it appears that the lowest DO in the stream is from the station closest to the lake.

Table 2.9 DO Monthly Averages

Month	East Lake AllData Dissolved Oxygen (mg/L)	East lake Outfall AllData Dissolved Oxygen (mg/L)
Jan	11.32	2.66
Feb	9.66	3.90
Mar	9.79	2.64
Apr	9.66	5.62
May	7.39	2.66
Jun	7.90	3.90
Jul	7.62	
Aug	10.99	4.11
Sep	6.78	
Oct	9.55	5.57
Nov	9.86	5.29
Dec	10.77	4.59
Average	9.27	4.30

The data in **Table 2.11** and **Figure 2.9** indicate that the monthly average DO is never below 5.0 mg/L in the lake (levels indicate excessive daytime algal respiration throughout the year) and almost never average above the criterion in the stream, with monthly average DOs below the criterion throughout the year in the stream. Additionally, as can be seen in **Table 2.10**, the DO percent saturation in the Lake is greater than 100 percent 75 percent of the time.

Table 2.10 DO Percent Saturation in East Lake

DO Saturation (Percent)	Period of Record	Count	Min	25th Percentile	Average	Median	75Th Percentile	Max
AllData	7/95, 1/96, 8/01, 2/06-11/06, 2/07	23	83.7	100.7	112.3	110.8	119.8	153.0
AllData-VerifiedP (a)	8/01, 2/06-11/06, 2/07	19	83.7	95.2	112.3	110.8	124.4	153.0

Table 2.11 DO Calendar Quarters and Annual Average

Dissolved Oxygen (mg/L)					
Year	Q1	Q2	Q3	Q4	Annual Average
East Lake 2006	10.86	8.31	8.03	9.90	9.28
East Lake Outfall 2005	3.90	4.13	3.85	5.54	4.35

Data in **Table 2.11** indicate that the lowest overall DO occurs during the third quarter in both the lake and the stream.

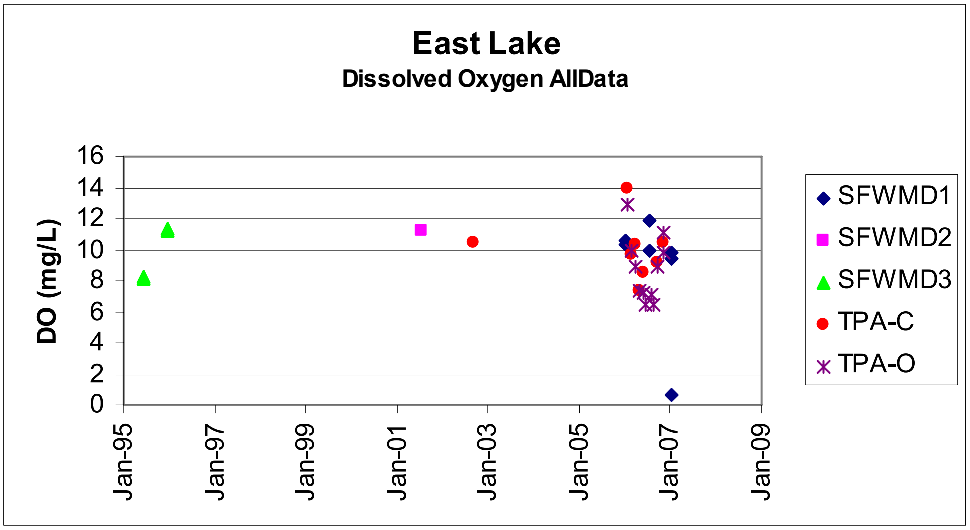


Figure 2.7 Dissolved Oxygen AllData East Lake

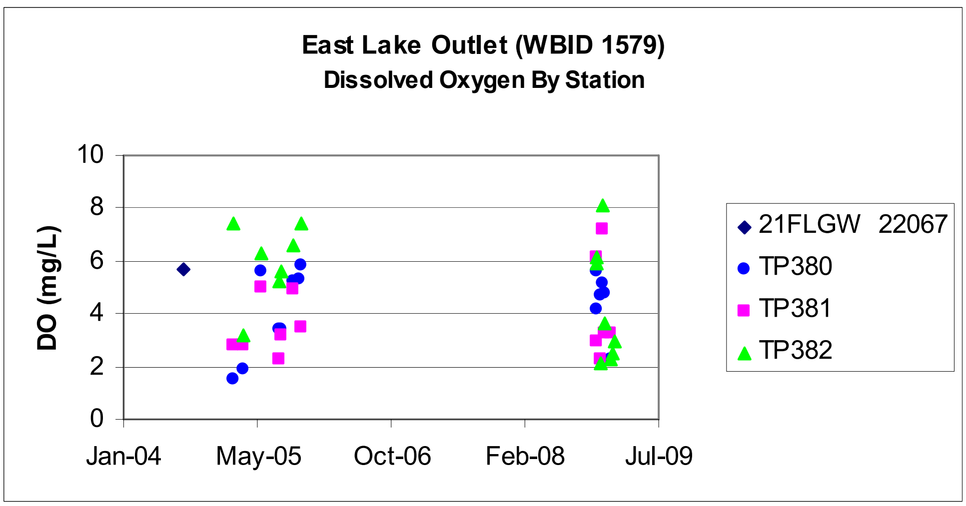


Figure 2.8 Dissolved Oxygen AllData East Lake Outfall

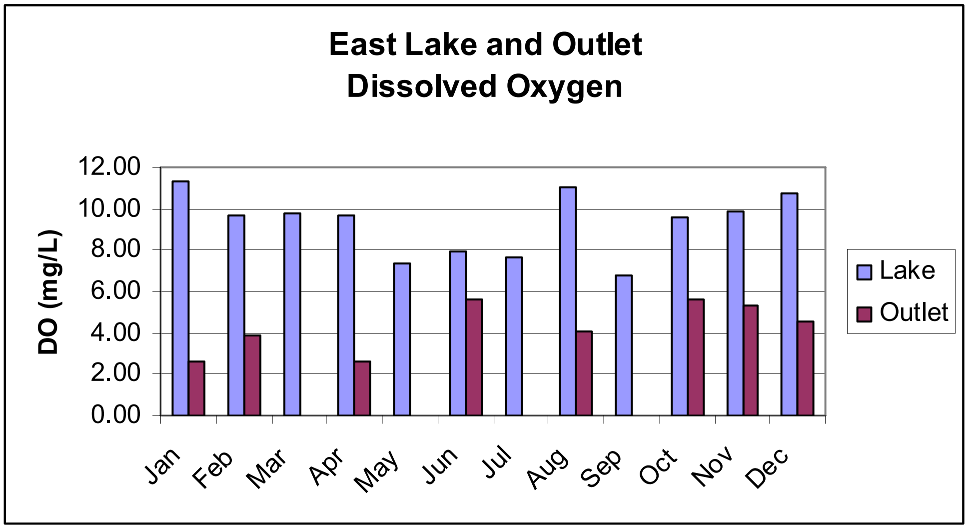


Figure 2.9 Dissolved Oxygen Monthly Average

Chlorophyll A (Chl a);

Table 2.12 Corrected Chlorophyll a (CChl a) East Lake (1579A)

East Lake CChla (µg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	7/95, 1/96, 8/01, 2/06-12/06,2/07, 8/07	29	4.20	35.00	52.94	53.00	71.00	124.15
AllData-VerifiedP (a)	8/01, 2/06-12/06, 2/07, 8/07	27	4.20	33.00	52.52	53.00	70.50	124.15
SFWMD-1	2/06, 8/06, 2/07, 8/07	4	79.29	79.52	93.88	86.05	100.41	124.15
SFWMD-2	8/01	1	38.20	38.20	38.20	38.20	38.20	38.20
SFWMD-3	7/95, 1/96	2	39.02	48.85	58.68	58.68	68.51	78.34
TPA-C	2/06 - 12/06	11	4.20	24.00	41.94	50.00	54.50	78.00
TPA-O	2/06 - 12/06	11	11.00	32.00	49.36	56.00	64.50	78.00

(a) Straight arithmetic average

Table 2.13 Corrected Chlorophyll a (CChl a) East Lake Outfall (1579)

East Lake Outfall CChla (µg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	8/04; 2/05-11/05	23	2.80	27.50	49.43	54.00	65.50	97.00
AllData-VerifiedP (a)	8/04; 2/05-11/05	23	2.80	27.50	49.43	54.00	65.50	97.00
21FLGW22067	8/04	1	26.00	26.00	26.00	26.00	26.00	26.00
TP380	2/05-11/05	8	16.00	43.25	54.63	61.00	64.00	90.00
TP381	2/05-11/05	7	6.10	38.50	53.01	54.00	68.50	97.00
TP382	2/05-11/05	7	2.80	20.00	43.26	39.00	64.00	93.00

(a) Straight arithmetic average

Table 2.12 and **Figure 2.10** depict the lake data for CChl a. From these data, the CChl a in the lake varies between 4.20 µg/L and 124.2 µg/L, with an average during the verified period (VP) of 52.5 µg/L. CChl a is generally higher at the station located near the outfall from the lake.

Table 2.13 and **Figure 2.11** depict the stream data for CChl a. From these data the CChl a in the stream varies between 2.80 µg/L and 97.0 µg/L with an average during the VP of 49.3 µg/L. Although data are limited and the stream data are from 2006 while the lake data are from 2005, it appears that average CChl a in the stream is slightly less than that in the lake. Additionally, it appears that CChl a decreases in the stream with distance from the lake.

Table 2.14 Chlorophyll a Monthly Average

Month	East Lake AllData CChla (µg/L)	East Lake Outfall AllData Cchla (µg/L)
Jan	78.34	
Feb	84.91	84.67
Mar	78.00	
Apr	57.00	18.30
May	15.55	
Jun	16.60	42.67
Jul	30.34	
Aug	65.70	41.14
Sep	57.50	
Oct	21.00	71.67
Nov	54.50	49.25
Dec	57.00	
Average	51.37	54.19

The limited (one year) data in **Table 2.14** and **Figure 2.12** indicate that monthly average CChl a on both systems peaks during spring and drops during the summer.

Table 2.15 Chlorophyll a Calendar Quarter and Annual Average

Chla (µg/L)					
Year	Q1	Q2	Q3	Q4	Annual Average
East Lake 2006	74.92	29.72	54.37	44.17	50.79
East Lake Outfall 2005	84.67	30.48	43.67	60.46	54.82

Data in **Table 2.15** indicate that the highest overall CChl a occurs during the first and fourth quarters (October-March) in stream, while the lake peaks in the first Quarter (January – March).

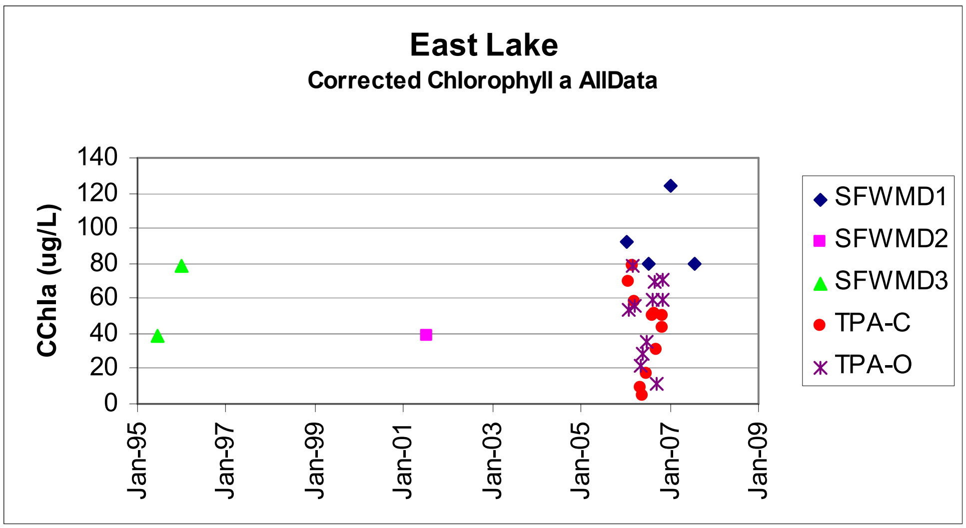


Figure 2.10 Corrected Chlorophyll a AllData East Lake

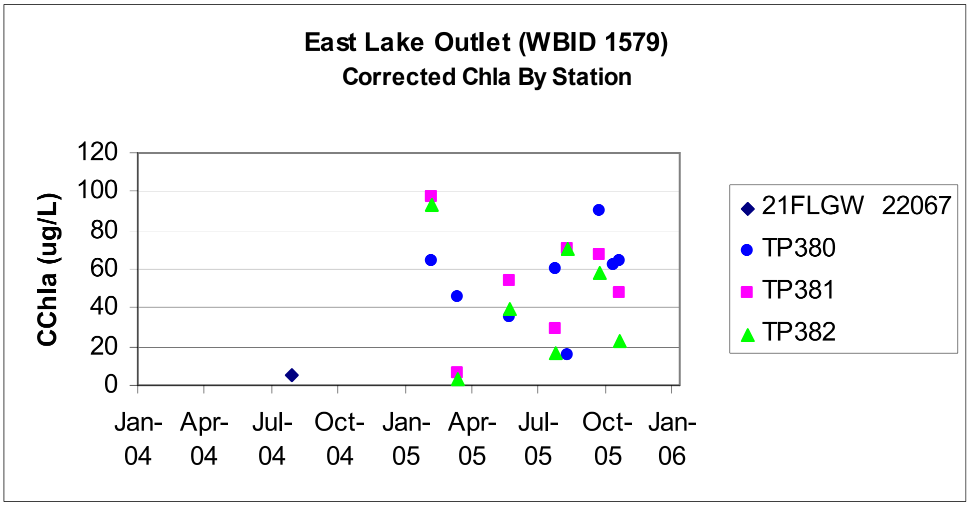


Figure 2.11 Corrected Chlorophyll a AllData East Lake Outfall

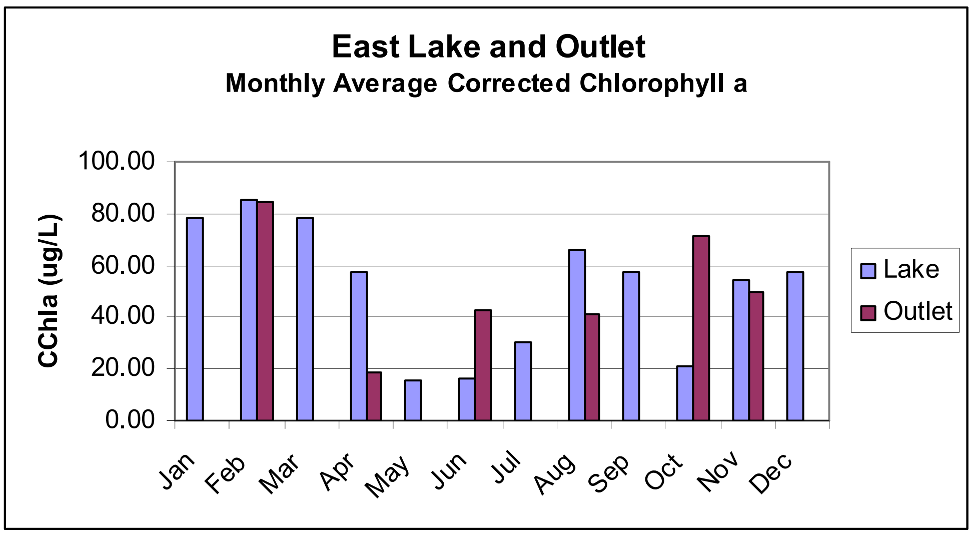


Figure 2.12 Chlorophyll a Monthly Average

Five Day Biological Oxygen Demand (BOD_5):

Table 2.16 Five Day Biological Oxygen Demand East Lake

East Lake BOD_5 (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	8/98, 10/02, 2/06-12/06	24	2.80	4.80	5.60	5.45	6.53	8.30
AllData-VerifiedP (a)	10/02, 2/06-12/06	23	2.80	4.80	5.50	5.40	6.25	8.30
SFWMD-1		0						
SFWMD-2		0						
SFWMD-3		0						
TPA-C	8/98, 10/02, 2/06 - 12/06	13	3.10	4.60	5.42	5.20	6.10	8.00
TPA-O	2/06 - 12/06	11	2.80	5.10	5.81	5.50	6.70	8.30

(a) Straight arithmetic average

Table 2.17 Five Day Biological Oxygen Demand East Lake Outfall

East Lake Outfall BOD_5 (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	2/05-11/05	22	1.50	2.50	3.18	3.25	4.00	4.70
AllData-VerifiedP (a)	2/05-11/05	22	1.50	2.50	3.18	3.25	4.00	4.70
TP380	2/05-11/05	8	2.10	2.88	3.35	3.35	4.05	4.30
TP381	2/05-11/05	7	1.50	2.35	3.26	3.80	4.05	4.70
TP382	2/05-11/05	7	1.80	2.25	2.90	3.10	3.40	4.10

(a) Straight arithmetic average

Table 2.16 and **Figure 2.13** depict the lake data for BOD_5. From these data, the BOD_5 in the lake varies between 2.80 mg/L and 8.30 mg/L, with an average during the verified period (VP) of

5.50 mg/L. BOD_5 is slightly higher (as is CChl a) at the station located near the outlet from the lake.

Table 2.17 and **Figure 2.14** depict the stream data for BOD_5. From these data the BOD_5 in the stream varies between 1.50 mg/L and 4.70 mg/L with an average during the VP of 3.18 mg/L. Although data are limited and the stream data are from 2006 while the lake data set is from 2005, it appears that average BOD_5 in the stream is slightly less than the lake. Additionally, it appears that BOD_5 decreases in the stream with distance from the lake.

Table 2.18 BOD_5 Monthly Average

Month	East Lake AllData BOD_5 (mg/L)	East Lake Outfall AllData BOD_5 (mg/L)
Jan		
Feb	7.70	4.33
Mar	4.70	
Apr	6.45	2.23
May	2.95	
Jun	5.30	3.63
Jul	5.60	
Aug	8.00	2.80
Sep	5.23	
Oct	5.50	3.83
Nov	4.85	2.75
Dec	6.95	
Average	5.79	3.34

The limited data (one year) in **Table 2.18** and **Figure 2.15** indicate that monthly average BOD_5 in both systems follows the seasonal pattern of CChl a peaking in the first and third quarters of the year.

Table 2.19 BOD_5 Calendar Quarter and Annual Average

BOD_5 (mg/L)					
Year	Q1	Q2	Q3	Q4	Annual Average
East Lake 2006	6.20	4.90	5.41	6.02	5.63
East Lake Outfall 2005	4.33	2.93	2.80	3.29	3.34

Data in **Table 2.19** indicate that the highest overall BOD_5 occurs during the first and fourth quarters (October-March) in both the stream and the lake, as does the CChl a.

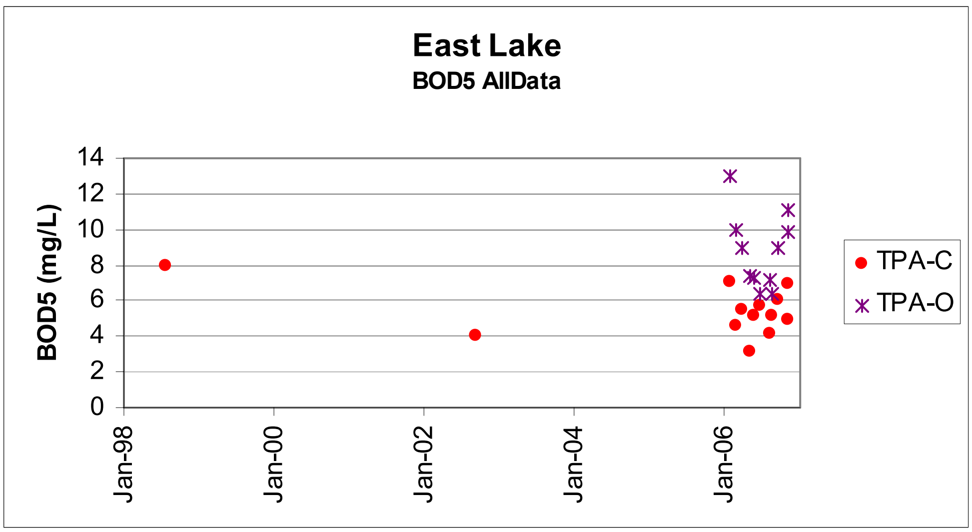


Figure 2.13 BOD_5 AllData East Lake

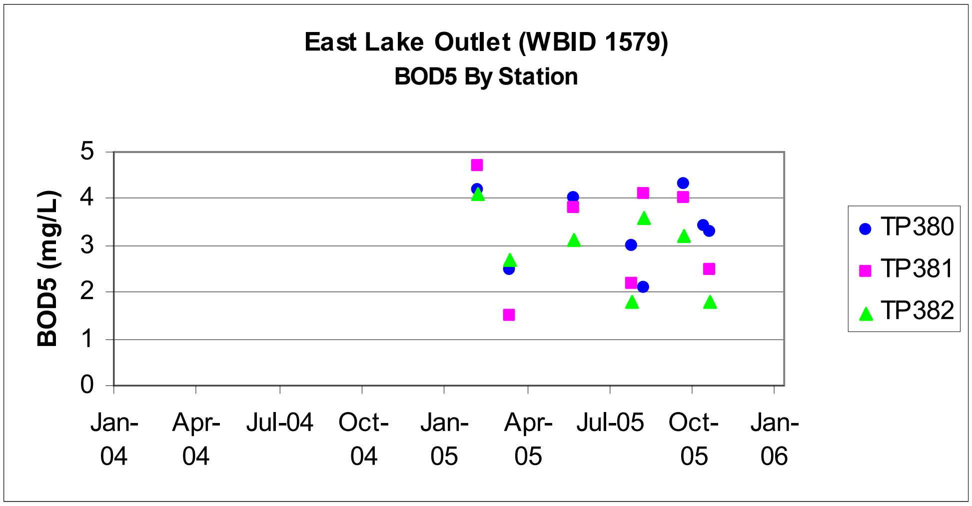


Figure 2.14 BOD$_5$ AllData East Lake Outfall

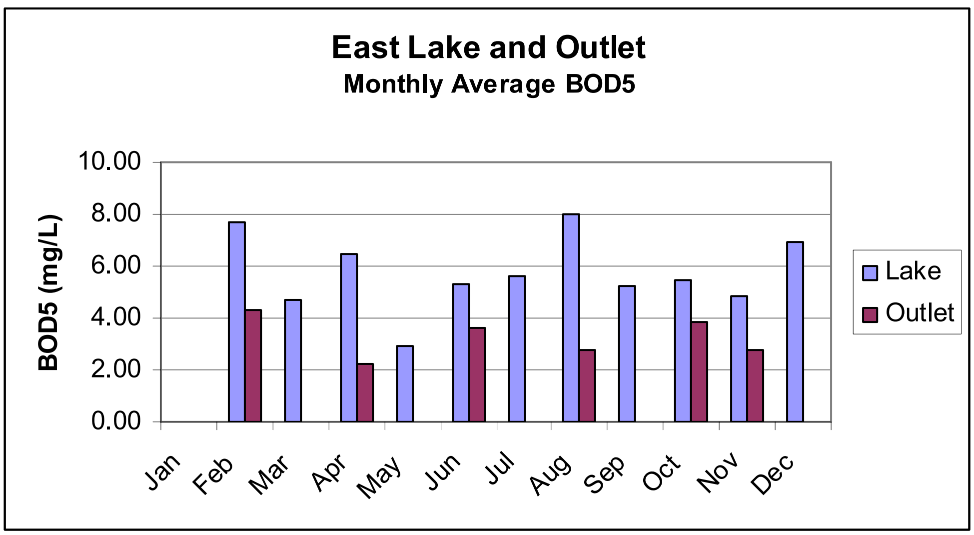


Figure 2.15 BOD$_5$ Monthly Average

Total Nitrogen (TN):

Table 2.20 Total Nitrogen East Lake

East Lake TN (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	7/95, 1/96, 8/01, 2/06-11/06, 2/07	26	0.64	1.75	2.08	2.10	2.57	3.41
AllData-VerifiedP (a)	8/01, 2/06-11/06, 2/07	24	1.11	1.85	2.11	2.10	2.50	3.41
SFWMD-1	2/06, 8/06, 2/07	3	2.14	2.25	2.40	2.36	2.54	2.71
SFWMD-2	8/01	1	1.27	1.27	1.27	1.27	1.27	1.27
SFWMD-3	7/95, 1/96	2	0.64	1.18	1.72	1.72	2.25	2.79
TPA-C	2/06 - 11/06	10	1.11	1.78	2.06	2.05	2.19	3.41
TPA-O	2/06 - 11/06	10	1.20	1.93	2.16	2.05	2.72	2.92

(a) Straight arithmetic average

Table 2.21 Total Nitrogen East Lake Outfall

East Lake Outfall TN (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	8/04; 2/05-11/05	23	1.01	1.44	1.76	1.80	2.00	2.50
AllData-VerifiedP (a)	8/04; 2/05-11/05	23	1.01	1.44	1.76	1.80	2.00	2.50
21FLGW22067	8/04	1	1.22	1.22	1.22	1.22	1.22	1.22
TP380	2/05-11/05	8	1.01	1.69	1.88	1.89	2.11	2.50
TP381	2/05-11/05	7	1.42	1.51	1.86	1.81	2.13	2.50
TP382	2/05-11/05	7	1.15	1.33	1.60	1.50	1.83	2.20

(a) Straight arithmetic average

Table 2.20 and **Figure 2.16** depict the lake data for TN. From these data, the TN in the lake varies between 0.64 mg/L and 3.41 mg/L, with an average during the verified period (VP) of 1.85 mg/L. TN is slightly higher (as is CChl a, and BOD_5) at the station located near the outlet from the lake.

Table 2.21 and **Figure 2.17** depict the stream data for TN. From these data, the TN in the stream varies between 1.01 mg/L and 2.50 mg/L, with an average during the VP of 1.76 mg/L. Although data are limited and the stream data are from 2006 while the lake data set is from 2005, it appears that average TN in the stream is slightly less than the lake. Additionally, it appears that TN decreases in the stream with distance from the lake (as does CChl a and BOD_5).

Table 2.22 TN Monthly Average

Month	East Lake AllData Total Nitrogen (mg/L)	East Lake Outfall AllData Total Nitrogen (mg/L)
Jan	0.64	
Feb	2.52	2.40
Mar	3.11	
Apr	2.57	2.18
May	2.31	
Jun	2.00	1.94
Jul	1.83	
Aug	1.82	1.35
Sep	2.05	
Oct	1.85	1.57
Nov	1.21	1.68
Dec		
Average	1.95	1.86

The limited data (one year) in **Table 2.22** and **Figure 2.18** indicate that monthly average TN in both systems follows the same pattern peaking in the spring and fall of the year with the seasonal TN in the same less than in the lake except during November.

Table 2.23 TN Calendar Quarter and Annual Average

Total Nitrogen (mg/L)					
Year	Q1	Q2	Q3	Q4	Annual Average
East Lake 2006	2.78	2.29	1.90	1.53	2.13
East Lake Outfall 2005	2.40	2.06	1.37	1.63	1.86

Data in **Table 2.23** indicate that the highest overall TN occurs during the first quarter (January-March) in both the stream and the lake.

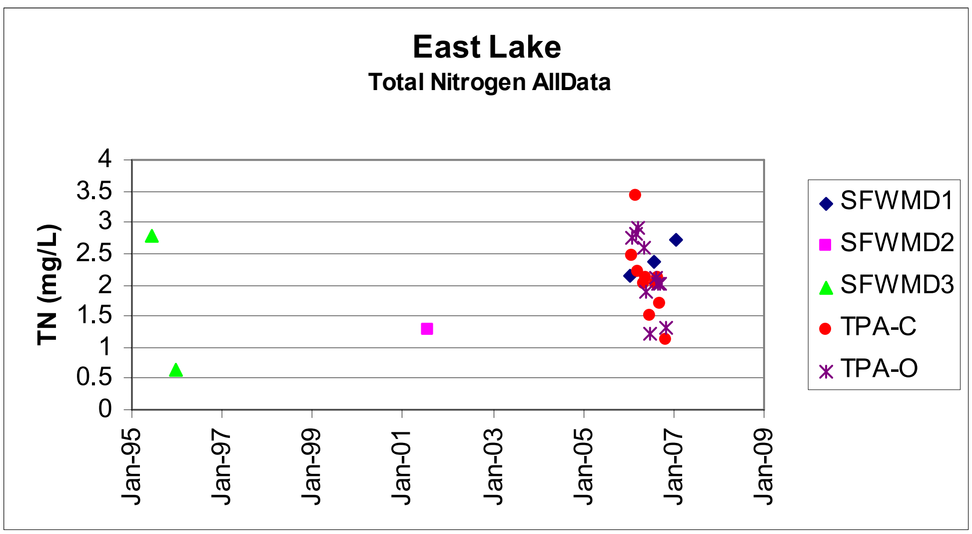


Figure 2.16 Total Nitrogen AllData East Lake

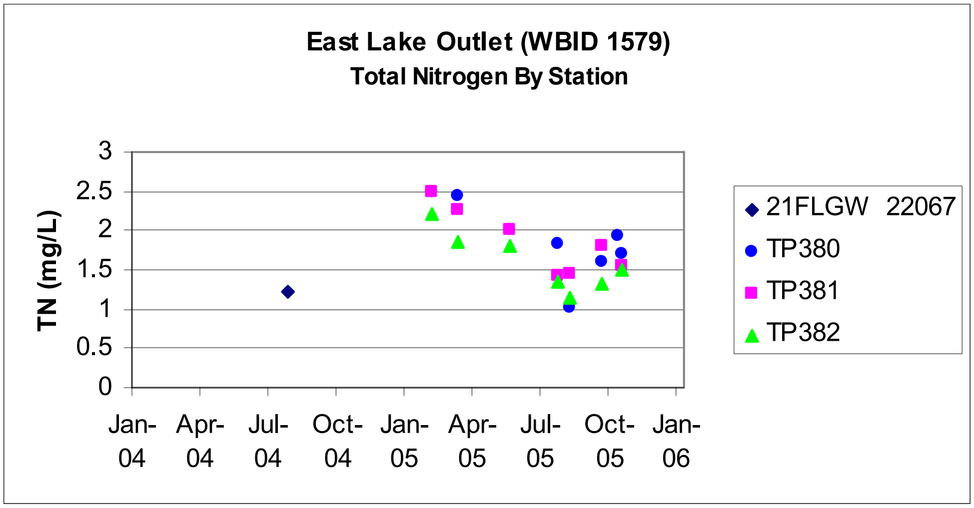


Figure 2.17 Total Nitrogen AllData East Lake Outfall

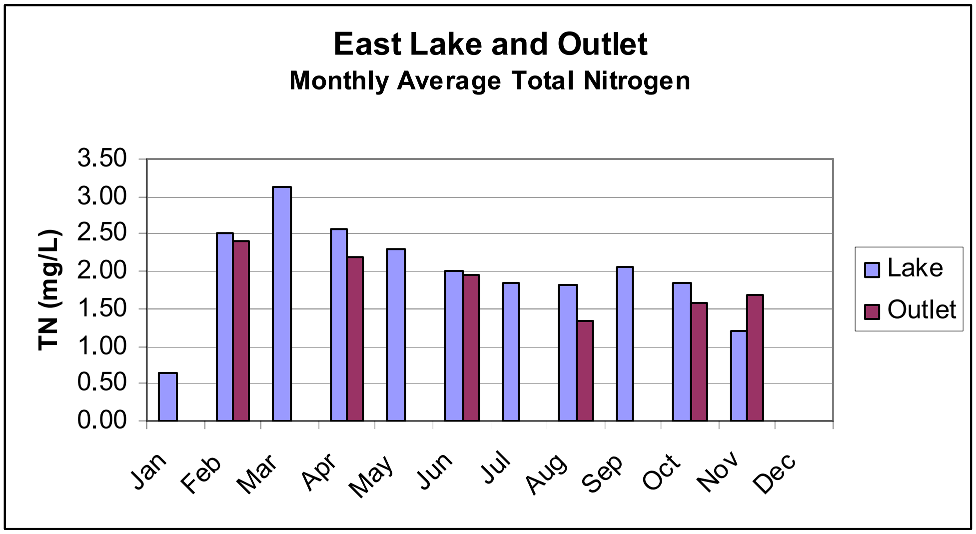


Figure 2.18 Total Nitrogen Monthly Average

Total Phosphorus (TP):

Table 2.24 Total Phosphorus East Lake

East Lake TP (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	7/95, 1/96, 8/01, 2/06-11/06, 2/07	26	0.005	0.053	0.081	0.083	0.110	0.170
AllData-VerifiedP (a)	8/01, 2/06-11/06, 2/07	24	0.005	0.054	0.082	0.083	0.110	0.170
SFWMD-1	2/06, 8/06, 2/07	3	0.020	0.024	0.051	0.027	0.066	0.105
SFWMD-2	8/01	1	0.005	0.005	0.005	0.005	0.005	0.005
SFWMD-3	7/95, 1/96	2	0.019	0.042	0.065	0.065	0.088	0.111
TPA-C	2/06 - 11/06	10	0.040	0.076	0.086	0.085	0.099	0.130
TPA-O	2/06 - 11/06	10	0.044	0.071	0.095	0.098	0.110	0.170

(a) Straight arithmetic average

Table 2.25 Total Phosphorus East Lake Outfall

East Lake Outfall TP (mg/L)	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
AllData	8/04; 2/05-11/05	23	0.067	0.105	0.156	23.000	0.180	0.420
AllData-VerifiedP (a)	8/04; 2/05-11/05	23	0.067	0.105	0.156	23.000	0.180	0.420
21FLGW22067	8/04	1	0.140	0.140	0.140	1.000	0.140	0.140
TP380	2/05-11/05	8	0.067	0.095	0.142	8.000	0.180	0.260
TP381	2/05-11/05	7	0.097	0.110	0.134	7.000	0.150	0.190
TP382	2/05-11/05	7	0.089	0.120	0.197	7.000	0.240	0.420

(a) Straight arithmetic average

Table 2.24 and **Figure 2.19** depict the lake data for TP. From these data, the TP in the lake varies between 0.005 mg/L and 0.170 mg/L, with an average during the verified period (VP) of 0.082 mg/L. TP is slightly lower (as opposed to CChl a, BOD_5, and TN)) at the station located near the outlet from the lake.

Table 2.25 and **Figure 2.20** depict the stream data for TP. From these data, the TP in the stream varies between 0.067 mg/L and 0.420 mg/L, with an average during the VP of 0.156 mg/L. Although data are limited and the stream data are from 2006 while the lake data set is from 2005, it appears that average TP in the stream is significantly greater than the TP concentration in the lake. Additionally, it appears that TP increases from the headwaters at the lake to the downstream most station in the stream (the opposite of the trends for CChl a, BOD_5, and TN).

Table 2.26 TP Monthly Average

Month	East Lake AllData Total Phosphorus (mg/L)	East Lake Outfall AllData Total Phosphorus (mg/L)
Jan	0.019	
Feb	0.084	0.190
Mar	0.125	
Apr	0.145	0.206
May	0.101	
Jun	0.103	0.193
Jul	0.072	
Aug	0.016	0.163
Sep	0.078	
Oct	0.076	0.085
Nov	0.042	0.107
Dec		
Average	0.08	0.16

The limited data (one year) in **Table 2.26** and **Figure 2.21** indicate that monthly average TP in both systems follows a similar seasonal pattern as TN, peaking in the spring, with the seasonal TP in the stream always higher than in the lake.

Table 2.27 TP Calendar Quarter and Annual Average

Total Phosphorus (mg/L)					
Year	Q1	Q2	Q3	Q4	Annual Average
East Lake 2006	0.101	0.116	0.053	0.059	0.082
East Lake Outfall 2005	0.190	0.200	0.167	0.096	0.163

Data in **Table 2.27** indicate that the highest overall TP in both systems occurs during the second quarter (April-June) and that the average concentration in the stream is almost double that in the lake.

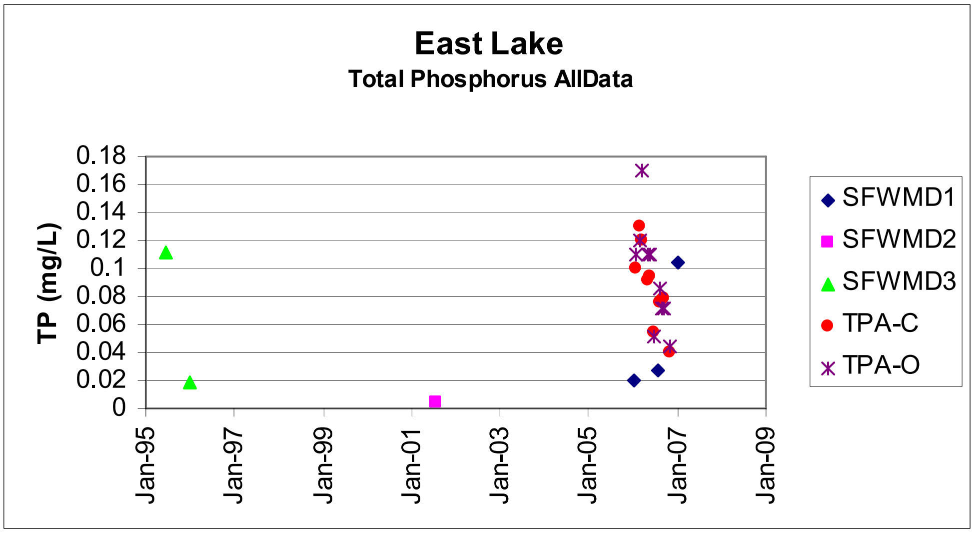


Figure 2.19 Total Phosphorus AllData East Lake

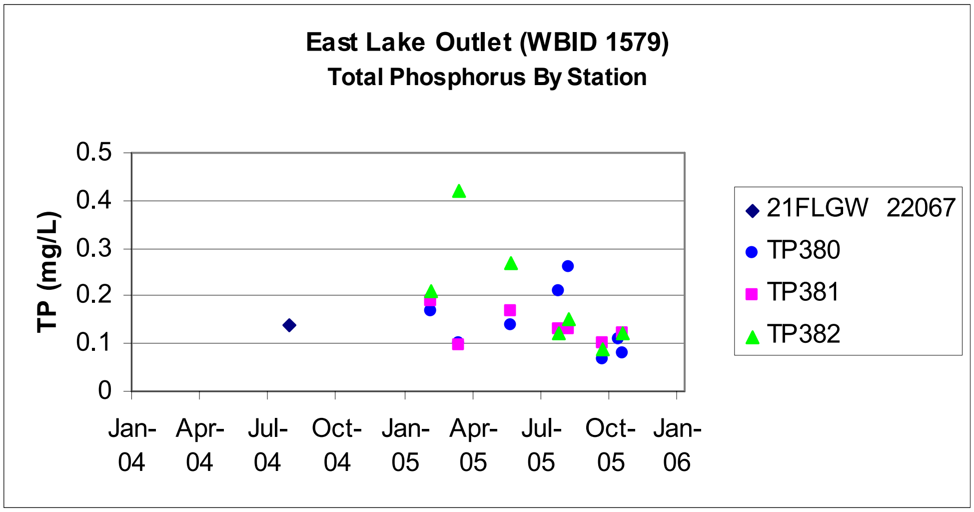


Figure 2.20 Total Phosphorus AllData East Lake Outfall

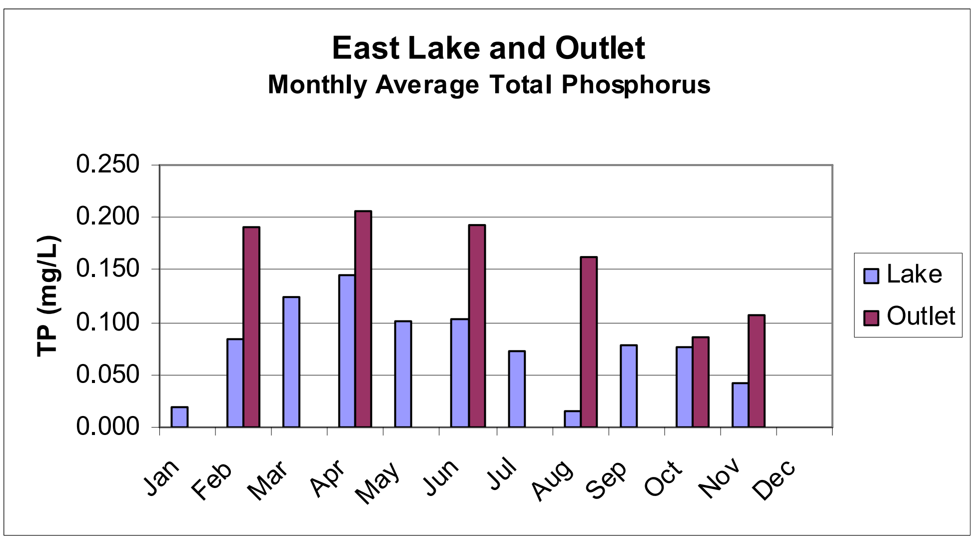


Figure 2.21 Total Phosphorus Monthly Average

Total Nitrogen to Total Phosphorus Ratio (TN/TP):

Table 2.28 TN to TP Ratio

TN/TP Ratio	Period of Record	Count	Minimum	25th Percentile	Average (a)	Median	75th Percentile	Maximum
East Lake	7/95, 1/96, 8/01, 2/06-11/06, 2/07	26	17.2	23.2	39.1	25.5	27.8	254.0
East Lake Outfall	8/04, 2/05-11/05	23	3.9	9.6	13.3	12.5	16.2	24.4

(a) Straight arithmetic average

Table 2.28 and **Figure 2.22** contain a summary of the information for limiting nutrients for both the lake and the stream. From these data, the lake would always be co-limited, approaching phosphorus limitation, except for a TN to TP ratio of over 160 in August. Because of the limited data, the high TN/TP value for August, brings the average for the entire dataset to phosphorus limitation. The limited data indicate that extreme phosphorus limitation may occur during the late summer and explain the low CChl a during this period. The stream data indicate co-limitation for both TN and TP, generally towards the low end of the range, with an average TN/TP of 13.3. The ratio of nitrogen to phosphorus declines during the growing season, as phosphorus in the stream becomes more abundant, reaching a seasonal minimum of 8.9 (nitrogen limited) during the late summer.

Table 2.29 TN to TP Ratio Monthly Average

Month	East Lake AllData TN/TP Ratio	East Lake Outfall AllData TN/TP Ratio
Jan	33.7	
Feb	45.6	12.8
Mar	24.8	
Apr	17.9	17.3
May	22.9	
Jun	19.7	10.9
Jul	25.4	
Aug	170.7	8.9
Sep	26.6	
Oct	24.7	18.9
Nov	28.7	16.2
Dec		
Average	39.1	13.35

The limited data (one year) in **Tables 2.28** and **2.29,** and **Figure 2.23** indicate that the lake, (while co-limited) is close to phosphorus limitation, and the stream while also co-limited, is closer to nitrogen limitation due to the elevated TP in the stream.

Table 2.30 TN to TP Ratio Calendar Quarter and Annual Average

TN/TP Ratio					
Year	Q1	Q2	Q3	Q4	Annual Average
East Lake 2006	34.7	20.1	74.2	26.7	38.9
East Lake Outfall 2005	12.8	14.1	8.9	17.6	13.3

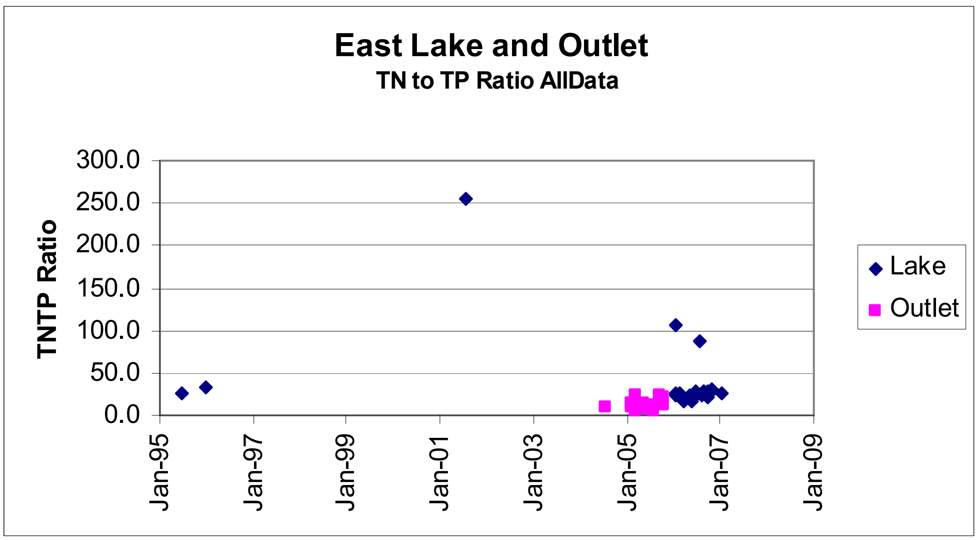


Figure 2.22 Total Nitrogen to Total Phosphorus Ratio

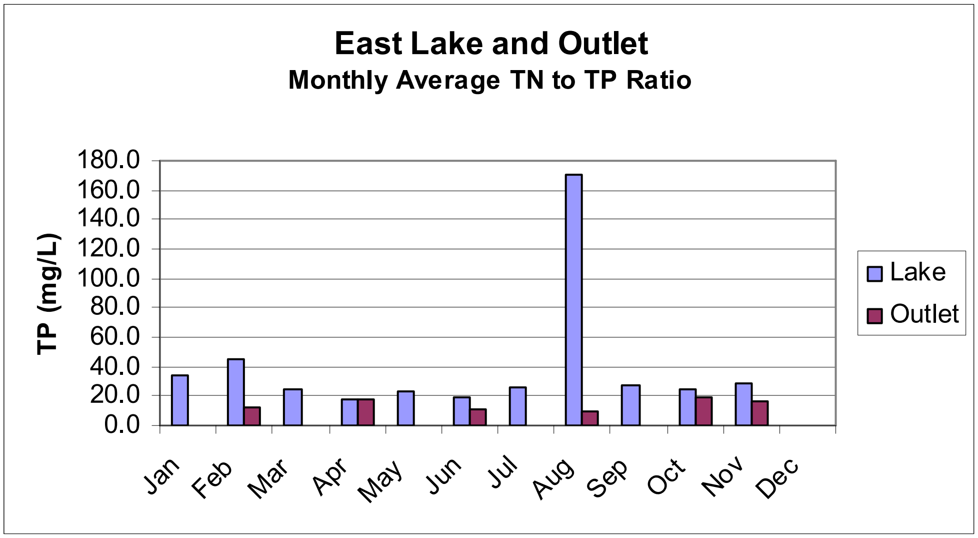


Figure 2.23 TN TP Ratio Monthly Average

Chapter 3: DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criteria Applicable to the TMDL

Florida's surface waters are protected for five designated use classifications, as follows:

Class I	**Potable water supplies**
Class II	**Shellfish propagation or harvesting**
Class III	**Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife**
Class IV	**Agricultural water supplies**
Class V	**Navigation, utility, and industrial use (there are no state waters currently in this class)**

East Lake and East Lake Outfall are Class III waterbodies, with a designated use of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife. The criteria applicable to these TMDLs are the Class III criteria for dissolved oxygen and nutrients.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

3.3 Narrative Nutrient Criteria Definitions

3.3.1 Chlorophyll a

Chlorophyll, a green pigment found in plants, is an essential component in the process of converting light energy (sunlight) into chemical energy through the process of photosynthesis. In photosynthesis, the energy absorbed by chlorophyll transforms carbon dioxide and water into carbohydrates and oxygen. The chemical energy stored by photosynthesis in carbohydrates drives biochemical reactions in nearly all living organisms. Thus, chlorophyll is at the center of the photosynthetic oxidation-reduction reaction between carbon dioxide and water.

There are several types of chlorophyll; however, the predominant form is chlorophyll *a* (Chl a). The measurement of Chl a in a water sample is a useful indicator of phytoplankton biomass, especially when used in conjunction with an analysis of algal growth potential and species abundance. The greater the abundance of Chl a, typically the greater the abundance of algae. Algae are the primary producers in the aquatic food web, and thus are very important in characterizing the productivity of estuarine systems.

3.3.2 Total Nitrogen as N

TN is the combined measurement of nitrate (NO_3), nitrite (NO_2), ammonia, and organic nitrogen found in water. Nitrogen compounds function as important nutrients for many aquatic organisms and are essential to the chemical processes that exist between land, air, and water.

The most readily bioavailable forms of nitrogen are ammonia and nitrate. These compounds, in conjunction with other nutrients, serve as an important base for primary productivity.

The major sources of excessive amounts of nitrogen in surface water are the effluent from municipal treatment plants and runoff from urban and agricultural sites. When nutrient concentrations consistently exceed natural levels, the resulting nutrient imbalance can cause undesirable changes in a waterbody's biological community and drive an aquatic system into an accelerated rate of eutrophication. Usually, the eutrophication process is observed as a change in the structure of the algal community and includes severe algal blooms that may cover large areas for extended periods. Large algal blooms are generally followed by depletion in DO concentrations as a result of algal decomposition.

3.3.3 Total Phosphorus as P

Phosphorus is one of the primary nutrients that regulates algal and macrophyte growth in natural waters, particularly in fresh water. Phosphate, the form in which almost all phosphorus is found in the water column, can enter the aquatic environment in a number of ways. Natural processes transport phosphate to water through atmospheric deposition, ground water percolation, and terrestrial runoff. Municipal treatment plants, industries, agriculture, and domestic activities also contribute to phosphate loading through direct discharge and natural transport mechanisms. The very high levels of phosphorus in some Florida streams and estuaries are usually caused by phosphate mining and fertilizer processing activities.

High phosphorus concentrations are frequently responsible for accelerating the process of eutrophication, or accelerated aging, of a waterbody. Once phosphorus and other important nutrients enter the ecosystem, they are extremely difficult to remove. They become tied up in biomass or deposited in sediments. Nutrients, particularly phosphates, deposited in sediments generally are redistributed to the water column. This type of cycling compounds the difficulty of halting the eutrophication process.

3.4 Dissolved Oxygen

Florida's DO criterion for Class III fresh water bodies states that DO shall not be less than 5.0 mg/L. Normal daily and seasonal fluctuations above these levels shall be maintained. However, DO concentrations in ambient waters can be controlled by many factors, including DO solubility, which is controlled by temperature and salinity; DO enrichment processes influenced by reaeration, which is controlled by flow velocity; the photosynthesis of phytoplankton, periphyton, and other aquatic plants; DO consumption from the decomposition of organic materials in the water column and sediment and oxidation of some reductants such as ammonia and metals; and respiration by aquatic organisms. East Lake Outfall was verified as impaired for dissolved oxygen based on 12 of the 22 measured values being below the Class III fresh water criterion.

3.5 Nutrients

Florida's nutrient criterion is narrative only i.e., nutrient concentrations of a body of water shall not be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. Accordingly, a nutrient-related target was needed to represent levels at which an imbalance in flora or fauna is expected to occur.

Numeric criteria for nutrients such as Total Nitrogen (TN) and Total Phosphorus (TP) are not explicitly stated in Chapter 62-302, FAC.

East Lake:

The IWR Rule 62-303.350 and 62-303.352, FAC, (Nutrients in Lakes) states that a lake with a mean color greater than 40 platinum cobalt units, is impaired when any annual mean TSI during the verified period exceeds 60, unless paleolimnological information indicates the lake was naturally greater than 60. Additionally a lake can be impaired, if data indicate that annual mean TSIs have increased over the assessment period, as indicated by a positive slope in the means plotted versus time, or the annual mean TSI has increased by more than 10 units over historical values. When evaluating the slope of mean TSIs over time, the Department shall require at least a 5 unit increase in TSI over the assessment period. The IWR Rule allows use of additional information indicating imbalance of flora or fauna due to nutrient enrichment. These include algal blooms, changes in alga species richness, excessive macrophyte growth, a decrease in the areal coverage or density of seagrasses or other submerged aquatic vegetation, and excessive diel oxygen variation. There were only sufficient data to calculate an annual average TSI for the year 2006. The TSI of 70.3 for East Lake in 2006 resulted from annual average CChl a of 50.79 µg/L, TN of 2.13 mg/L, and a TP of 0.082 mg/L. This TSI of 70.3 in 2006 is greater than the threshold of 60. Exceeding this threshold in any one year of the verified period is sufficient to list the lake as impaired for nutrients.

East Lake Outfall:

While the IWR provides a threshold for nutrient impairment for streams based on annual average CChl a levels, these thresholds are not standards and need not be used as the nutrient-related water quality target for TMDLs. In fact, in recognition that the IWR thresholds were developed using statewide average conditions, the IWR (Section 62-303.450, F.A.C.) specifically allows the use of alternative, site-specific thresholds that more accurately reflect conditions beyond which an imbalance in flora or fauna occurs in the waterbody. The IWR used the threshold concentration of 20.0 µg/L CChl a for assessing East Lake Outfall for nutrient impairment. As discussed previously, the stream exceeded this threshold in the year 2005 of the verified period and was determined to be impaired for nutrients.

3.6 Nutrient Target Development

East Lake is the headwaters of East Lake Outfall, which ultimately drains into the Tampa By-Pass Canal. Data for TN from the three stations in the stream indicate a decreasing concentration with distance from the lake. Based on this information, TN concentrations coming out of the lake are expected to be the highest values in the outlet stream.

East Lake:

The TMDL for nutrients in East Lake was based on using the TSI calculation method and reducing the nutrient and CChl a concentrations to levels that would produce an annual average TSI of less than 60, while maintaining the lake as a co-limited system for nutrients (median TN/TP ratio ~25). Percent reductions were then calculated for TN and TP based on the highest quarterly mean from the year that was the basis of the impairment (2006). While the lake was not impaired for DO, the downstream stream is impaired for DO. As a result of this downstream impairment, the anthropogenic sources of BOD_5 in the lake (and thus entering the stream) must be eliminated as a part of the solution to the low DO in the stream.

East Lake Outfall:

Insufficient data exist at this time to develop a credible empirical model for East Lake Outfall. Additionally, as the data for the lake and the data for the stream are from different years, conditions in the lake could not be directly compared to conditions in the stream. Based on the relationship between the lake and stream, the DEP is proposing that the percent reductions for nutrients in the lake be used for the entire watershed and that BOD_5 be reduced to a level that would address anthropogenic sources of BOD.

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

An important part of the TMDL analysis is the identification of pollutant source categories, source subcategories, or individual sources of pollutants in the impaired waterbody and the amount of pollutant loadings contributed by each of these sources. Sources are broadly classified as either "point sources" or "nonpoint sources." Historically, the term point sources has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term "nonpoint sources" was used to describe intermittent, rainfall-driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition.

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA's National Pollutant Discharge Elimination System (NPDES) Program. These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites over five acres, and a wide variety of industries (see **Appendix A** for background information on the federal and state stormwater programs).

To be consistent with Clean Water Act definitions, the term "point source" will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) ***and*** stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see **Section 6.1**). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES stormwater discharges and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

4.2 Potential Sources of Nutrients and BOD in the East Lake and East Lake Outfall Watersheds

4.2.1 Point Sources

There are no NPDES permitted domestic or Industrial wastewater facilities that discharge within the watershed.

Municipal Separate Storm Sewer System Permittees

The stormwater collection systems owned and operated by Hillsborough County and Co-Permittees, including FDOT District 7 are covered by a Phase I NPDES municipal separate storm sewer system (MS4) permit (FLS000006). There are no Phase II MS4 permits identified for this watershed.

4.2.2 Land Uses and Nonpoint Sources

As reported in the Hillsborough County Master Stormwater Plan for this watershed (Plan), residential areas are concentrated around the north rim of lake and along the stream corridor. The majority of these developments are older developments with little to no stormwater treatment in place.

The Plan includes results from a set of calibrated and validated water quantity and quality models. One of the models used was the National Resources Conservation Service (NRCS) Dimensionless Unit Hydrograph Method. This model was used to generate runoff hydrographs that were input and routed through a modified version of the Storm Water management Model (SWMM) version 4.31 using the curve number method. The SWMM modification was to allow for directly integrating the curve number method to generate the runoff hydrographs, entrance and exit headloss coefficient, and conduit stretch factors.

The model was calibrated to the July 13-19 1990 storm event due to availability of data and verified for rain events in 1991, 1992, and 1999. The computed maximum water levels in the lake were slightly higher than the observed and the simulated water level in the lake drops faster than the recorded data. The report states that this was due to seepage inflow and inflows from directly connected areas to the lake that were not included in the model. This resulted in model stage declining faster than the recorded data. In general, the county concluded that the model was calibrated and verified and suitable for simulating major storm events in the watershed.

Parsens Engineering Sciences Inc., in 1998 was contracted to develop a water quality model capable of quantifying pollutant loading and removal. The model was incorporated into a Visual Basic-driven Excel spreadsheet model. The model is based on land use, soils, runoff coefficient, runoff amounts, event mean concentrations, and Best Management Practices (BMPs). The Plan provides a summary by subbasin of estimated loadings for BOD_5, TSS, TKN, NO23, TN, TP, TDP, oil/grease, cadmium, copper, lead, and zinc for a variety of conditions, current, past, and future.

In 1995, Hillsborough County and the SWFWMD commissioned Environmental Research and Design (ERD) to perform a study on the lake as part of a restoration/evaluation plan. This study indicated that a major loading source for nitrogen, phosphorus, and BOD_5 being introduced into the lake had its origins in the bird rookery that exists on a small island (Bird Island) in the northeast portion of the lake (**Figures 1.2, 1.3, and 4.1**).

The Plan contains conflicting information regarding the water and mass balance. In the text it states that the annual average water budget is made up of 50% stormwater runoff, 11% baseflow, 20% ground water seepage, and 19% rainfall directly on the lake. However, Table 7.5 in the Plan states that baseflow is 50 percent and that runoff is only 11 percent. As the text and the tables in the report do not match up, no further discussion of these findings are presented in this report. However, as noted above, the report also states that the major source of pollutants to the lake was attributed to the bird population of Bird Island (**Figure 4.1**). The island is reported to generate 2619 kg/yr (15.8 lbs/day) of TN (about 30% of the total mass of TN entering the lake), 1065 kg/yr (6.43 lbs/day) of TP or about 75% of all the TP entering the lake, and 18,489 kg/yr (111.67 lbs/day) of BOD_5, about 66% of all the BOD_5.

Data reported for nutrient loadings from waterfowl in the TMDL for West Clark Lake "Nutrient TMDL for West Clark Lake (WBID 1971)" by Dr. Andrzej Baniukiewicz, November 3, 2005 indicated that annual average loadings in the literature range from values as low as 3.89 grams of TN per bird per year (g/b/y) and 1.31 g/b/y for TP by Marion et al for Lake Grand-Lieu in France, to values as high as 41.8 g/b/y TN and 16.8 g/b/y for TP found by Andersen et al for a wetland in California.

Based on these bird loading rates for TN and TP and the loads reported in the Plan, the number of birds roosting on the 0.8 acre island each day should range from a low of 172 (assuming the highest loading rate) to 2227 (assuming the lowest loading rate).

Figure 4.1 Bird Island

After a visual inspection of the watershed, it is the DEP expectation that loadings from the canal system extending out from the lake into the surrounding neighborhood (**Figures 4.2** and **4.3**), as well as internal recycling of nutrients within the lake, may be contributing a substantial fraction of the loadings attributed to birds in the Plan. Actual data on the numbers of birds and data from the island should be collected together with a better characterization of the mass loading from the canal network, before this large a load is attributed to birds.

Figure 4.2 Western Arm of the Lake

Figure 4.3 Eastern Arm of the Lake

Nonpoint source pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. Nonpoint pollution is caused by rainfall moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water (EPA, 1994). Potential nonpoint sources of BOD and nutrients include loadings from surface runoff, wildlife, livestock, pets, leaking sewer lines, and leaking septic tanks.

Land Uses

The spatial distribution and acreage of different land use categories for the two WBIDs were identified using the SWFWMD's 2004 land use data (scale 1:40,000) contained in the Department's geographic information system (GIS) library. Land use categories in the watershed were aggregated and are tabulated in **Table 4.1**. **Figure 4.4** shows the acreage of the principal land uses in the two watersheds.

As shown, the watershed drains about 1166 acres of land. The dominant land uses in the watershed are high density residential (26.2 percent), followed by commercial and services (22.8 percent), transportation (7.35 percent), crop and pasture (7.33 percent), and open land (6.45 percent).

Table 4.1 Classification of Land Use Categories for East Lake and East Lake Outfall, WBIDs

FLUCCs Code	Landuse	Acreage	% Acreage
1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	59.7	5.12
1300	RESIDENTIAL HIGH DENSITY	305.4	26.18
1400	COMMERCIAL AND SERVICES	265.6	22.77
1500	INDUSTRIAL	43.3	3.71
1700	INSTITUTIONAL	63.9	5.48
1800	RECREATIONAL	56.2	4.82
1900	OPEN LAND	75.3	6.45
2100	CROPLAND AND PASTURELAND	85.5	7.33
2200	TREE CROPS	10.8	0.93
3200	SHRUB AND BRUSHLAND	5.4	0.46
4100	UPLAND CONIFEROUS FOREST	19.8	1.70
4340	HARDWOOD CONIFER MIXED	6.7	0.58
5100	STREAMS AND WATERWAYS	0.0	0.00
5200	LAKES	4.1	0.35
5300	RESERVOIRS	50.3	4.31
6300	WETLAND FORESTED MIXED	5.7	0.49
6410	FRESHWATER MARSHES	16.1	1.38
6430	WET PRAIRIES	4.6	0.40
6440	EMERGENT AQUATIC VEGETATION	2.4	0.20
8100	TRANSPORTATION	85.7	7.35
	Grand Total	1166.4	100

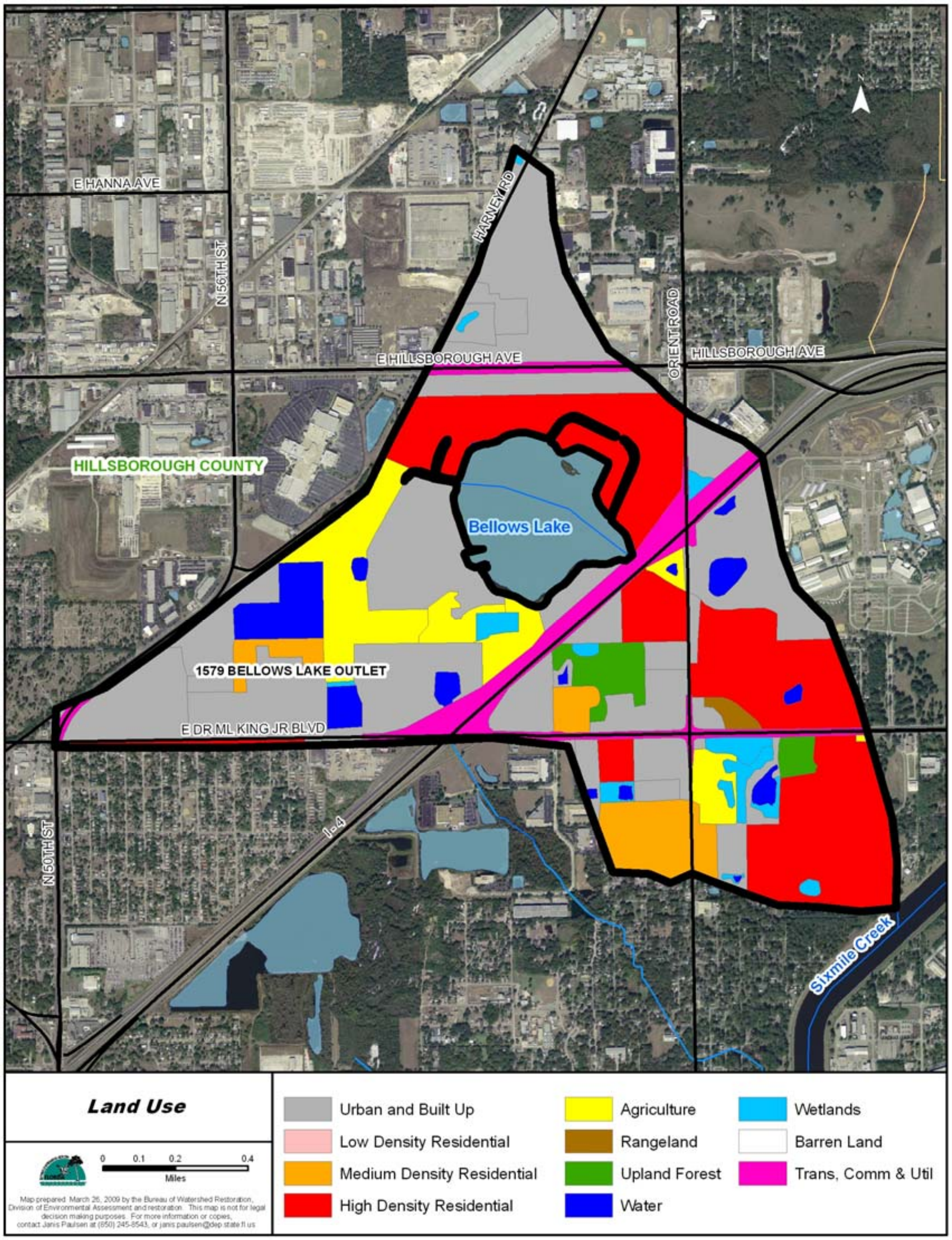


Figure 4.4 Principal Land Uses in the East (Bellows) Lake and East (Bellows) Lake Outfall WBIDs, in 2004

Septic Tanks

Septic tanks are another potentially important source of BOD and nutrients. In areas with a relatively high ground water table, the drainage field can be flooded during the rainy season, and pollutants can be transported to the surface water through storm runoff. Additionally, any well that is installed in the surficial aquifer system will cause a drawdown around the well. If the septic tank system is built too close to the well (e.g., less than 75 feet), the septic tank discharge will be within the cone of influence of the well. As a result, septic tank effluent may go into the well and once the polluted water is used to irrigate lawns, pollutants may reach the land surface and wash into surface waters during rain events.

However, based on the 2009 Florida Department of Health (FDOH) onsite sewage GIS coverage (http://www.doh.state.fl.us/environment/programs/EhGis/EhGisDownload.htm), only 1 housing unit (*N*) was identified in the East Lake watershed and 29 housing units in the East Lake Outfall watershed as being on septic tanks (7 tanks identified as abandoned). Therefore, the contribution of septic tanks for BOD and nutrients to East Lake and East Lake Outfall is not expected to be significant.

Sanitary Sewer Overflows

Sanitary sewer overflows (SSOs) can also be a potential source of nutrients and BOD pollution. Human sewage can be introduced into surface waters even when storm and sanitary sewers are separated. Leaks and overflows are common in many older sanitary sewers where capacity is exceeded, high rates of infiltration and inflow occur (i.e., outside water gets into pipes, reducing capacity), frequent blockages occur, or sewers are simply falling apart due to poor joints or pipe materials. Power failures at pumping stations are also a common cause of SSOs. The greatest risk of an SSO occurs during storm events; however, few comprehensive data are available to quantify SSO frequency and bacteria loads in most watersheds.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

East Lake:

The TMDL for nutrients in East Lake was based on achieving a target TSI of 60 for both nutrients and CChl a. Using the equations for calculating TSI as shown in Chapter 2, reductions in TN and TP were made while maintaining the TN to TP ratio at the median ratio from the lake data of 25 (co-limitation) until a nutrient TSI less than 60 was achieved. The TMDL percent reductions were developed using the highest quarterly mean concentrations of TN, TP, and CChl a during the year (2006) that resulted in the impairment. Additionally, a BOD_5 TMDL was established in East Lake to address anthropogenic sources of BOD and to improve the DO in the downstream water (East Lake Outfall), as it is impaired for DO.

East Lake Outfall:

Insufficient data exist at the time of this report to develop a credible empirical model for East Lake Outfall. Additionally, as the data for the lake and the data for the stream are from different periods of time, conditions in the lake could not be directly compared to conditions in the stream. Based on the relationship between the lake and stream, the DEP is proposing that the percent reductions for nutrients in the lake be used for the entire watershed and that BOD_5 be reduced to a level that would address anthropogenic sources of BOD.

5.1.1 Data Used in the Determination of the TMDL

The data used to develop this TMDL were obtained through the IWR dataset "Run 35-3", and are listed in **Appendix B**.

5.1.2 TMDL Development Process for East Lake and East lake Outfall

As described in **Section 5.1**, the method used to determine the percent reductions in the lake was to achieve a nutrient and CChl a TSI of 60 and a reduction in BOD as required to improve DO in the downstream impaired waterbody. The resulting percent reductions in TN, TP, and BOD_5 were applied to the entire watershed.

Percent reduction was calculated by subtracting the TMDL target concentration from the worst-case impairment concentration, dividing by the worst-case concentration and multiplying times 100.

BOD5:

Table 2.16 presents the quarterly and annual average data for BOD_5 in both the lake and the stream. The highest quarterly average BOD_5 (6.20 mg/L) occurred in the lake during the first quarter. Based on the DEP experience assessing DO impairments, if the BOD_5 is elevated above 2.0 mg/L it may be considered as causing or contributing to low DO conditions in the waterbody. Therefore, to address uncertainty and provide for margin of safety for the DO impairment, the BOD TMDL was established as an annual average of 2.00 mg/L. The BOD_5 TMDL was calculated as the percent reduction required to reduce a BOD_5 of 6.20 mg/L to 2.00 mg/L or 67.7 percent.

Percent Reduction =
((6.20 – 2.00)/6.20)*100)
= (4.20/6.20)*100
= 0.677*100
= 67.7 percent.

Corrected Chlorophyll a:

Table 2.13 presents the quarterly and annual average data for CChl a in the lake. The annual average CChl a in the lake was 50.79.

Using the TSI calculation method as shown in Chapter 2, CChl a concentrations were reduced from the annual average of 50.79 until a CChl a TSI less than 60 was achieved. A CChl a of 20 ug/L results in a chlorophyll TSI of 59.9. The percent reduction in algal biomass in the lake was calculated as the reduction from 50.79 ug/L to 20.0 ug/L, or 60.6 percent.

Percent Reduction =
(50.79-20.00)/50.79)*100
= (30.79/50.79)*100
= 0.606*100
= 60.6 percent.

Total Nitrogen:

Table 2.20 presents the quarterly and annual average data for TN in both the lake and the stream. The highest quarterly average TN (2.78 mg/L) occurred in the lake during the first quarter. Based on the results from the TSI calculation, a TN of 1.40 mg/L in combination with a TP of 0.055 mg/L results in a nutrient TSI of 59.4 (TN/TP ratio = 25.4). The TN concentration of 1.40 mg/L is the target concentration for the TMDL and the worst-case concentration identified above is 2.78 mg/L. The TN TMDL was calculated as the percent reduction required to reduce a TN of 2.78 mg/L to 1.40 mg/L or 49.6 percent.

Percent Reduction =
((2.78 – 1.40)/2.78)*100);
= (1.38/2.78)*100,
= 0.496*100
= 49.6 percent.

Total Phosphorus:

Table 2.24 presents the quarterly and annual average data for TP in both the lake and the stream. The highest quarterly average TP (0.116 mg/L) occurred in the lake during the second quarter. Based on the results from the TSI calculation, a TP of 0.055 mg/L in combination with a TN of 1.40 mg/L results in a nutrient TSI of 59.4 (TN/TP ratio = 25.4). The TP concentration of 0.055 mg/L is the target concentration for the TMDL and the worst-case concentration identified above is 0.116 mg/L. The TP TMDL was calculated as the percent reduction required to reduce a TP of 0.116 mg/L to 0.055 mg/L or 52.6 percent.

Percent Reduction =
((0.116 – 0.055)/0.116)*100);
= (0.061/0.116)*100,
= 0.526*100
= 52.6 percent.

Table 5.1 East Lake and East Lake Outfall TMDL Target Concentrations and Percent Reductions for TN and TP required to meet Water Quality Standards for Nutrients and BOD_5 Required to meet DO Standards Downstream In East Lake Outfall

	TMDL	VP Quarterly Maximum	Percent Reduction
TN (mg/L)	1.4	2.78	49.6
TP (mg/L)	0.055	0.116	52.6
BOD_5 (mg/L)	2	6.20	67.7

5.1.3 Critical Conditions/Seasonality

The critical conditions for nutrient and BOD_5 loadings in a given watershed depend on the existence of point sources, land use patterns, and rainfall in the watershed. Typically, the critical condition for nonpoint sources is an extended dry period, followed by a rainfall runoff event. During wet weather periods, pollutants that have built up on the land surface under dry weather conditions are washed off by rainfall, resulting in wet weather loadings. However, significant nonpoint source contributions could also occur under dry weather conditions without any major surface runoff event. This usually happens when nonpoint sources contaminate the surficial aquifer, and pollutants are brought into the receiving waters through baseflow. Animals with direct access to the receiving water could also contribute to the exceedances during dry weather conditions. The critical condition for point source loading typically occurs during periods of low stream flow, when dilution is minimized. As previously noted, there are no point source discharges within the watershed. The evaluation of rainfall in 2005 and 2006 indicated that rainfall was fairly typical, with neither being an extreme wet or dry year.

Chapter 6: DETERMINATION OF THE TMDL

6.1 Expression and Allocation of the TMDL

The objective of a TMDL is to provide a basis for allocating acceptable loads among all of the known pollutant sources in a watershed so that appropriate control measures can be implemented and water quality standards achieved. A TMDL is expressed as the sum of all point source loads (Wasteload Allocations, or WLAs), nonpoint source loads (Load Allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\textbf{TMDL} = \sum \textbf{WLAs} + \sum \textbf{LAs} + \textbf{MOS}$$

As discussed earlier, the WLA is broken out into separate subcategories for wastewater discharges and stormwater discharges regulated under the NPDES Program:

$$\textbf{TMDL} \cong \sum \textbf{WLAs}_{\textbf{wastewater}} + \sum \textbf{WLAs}_{\textbf{NPDES Stormwater}} + \sum \textbf{LAs} + \textbf{MOS}$$

It should be noted that the various components of the revised TMDL equation may not sum up to the value of the TMDL because (a) the WLA for NPDES stormwater is typically based on the percent reduction needed for nonpoint sources and is also accounted for within the LA, and (b) TMDL components can be expressed in different terms (for example, the WLA for stormwater is typically expressed as a percent reduction, and the WLA for wastewater is typically expressed as mass per day).

WLAs for stormwater discharges are typically expressed as "percent reduction" because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish loads from MS4s from other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the "maximum extent practical" through the implementation of best management practices (BMPs).

This approach is consistent with federal regulations (40 CFR § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or **other appropriate measure**. The TMDLs for East Lake and East Lake Outfall are expressed in terms of a percent reduction, these TMDLs represent the maximum daily loads that East Lake and East Lake Outfall can assimilate and maintain the nutrient and DO criteria **(Tables 6.1a** and **b).**

Table 6.1a TMDL Components for Nutrients and BOD_5 in East Lake (WBID 1579A)

WBID	Parameter	WLA		LA (% reduction)	MOS
		Wastewater	NPDES Stormwater (% reduction)		
1579A	Total Nitrogen	N/A	49.6	49.6	Implicit
1579A	Total Phosphorus	N/A	52.6	52.6	Implicit
1579A	BOD_5	N/A	67.7	67.7	Implicit

N/A – Not applicable.

Table 6.1b TMDL Components for Nutrients and BOD_5 in East Lake Outfall (WBID 1579)

WBID	Parameter	WLA		LA (% reduction)	MOS
		Wastewater	NPDES Stormwater (% reduction)		
1579	Total Nitrogen	N/A	49.6	49.6	Implicit
1579	Total Phosphorus	N/A	52.6	52.6	Implicit
1579	BOD_5	N/A	67.7	67.7	Implicit

6.2 Load Allocation

East Lake (1579A):

A percent reduction in TN of 49.6% and TP of 52.6% is needed from nonpoint sources in the East Lake watershed for the lake to achieve a TSI of 60. A BOD_5 TMDL reduction of 67.7% was established for the Lake as the downstream waterbody is impaired for DO. It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the water management districts that are not part of the NPDES Stormwater Program (see **Appendix A).**

East Lake Outfall (1579):

A percent reduction in TN of 49.6%, TP of 52.6%, and BOD_5 of 67.7% is needed from nonpoint sources in the East Lake Outfall watershed for the stream to achieve water quality standards for nutrients and DO. It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the water management districts that are not part of the NPDES Stormwater Program (see **Appendix A).**

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

There are no NPDES surface water dischargers within the East Lake or East lake Outfall Watersheds

6.3.2 NPDES Stormwater Discharges

East Lake (1579A):

The WLA for stormwater discharges with an MS4 permit is a percent reduction in TN of 49.6% and TP of 52.6%. These reductions are needed from nonpoint sources in the East lake watershed for the lake to achieve a TSI of 60 on an annual average basis. A BOD_5 TMDL reduction of 67.7% was established for the Lake as the downstream waterbody is impaired for DO. It should be noted that any MS4 permittee is only responsible for reducing the anthropogenic loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

East Lake Outfall (1579):

The WLA for stormwater discharges with an MS4 permit is a percent reduction in TN of 49.6%, TP of 52.6%, and BOD_5 of 67.7%. These reductions are needed from nonpoint sources in the East lake watershed for the lake to achieve standards for nutrients and DO. It should be noted that any MS4 permittee is only responsible for reducing the anthropogenic loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Department, February 2001), an implicit MOS was used in the development of this TMDL. An MOS was included in the TMDL by establishing the reductions based on the maximum quarterly concentrations of TN, TP, and BOD_5.

6.5 Evaluating Effects of the TMDL on DO

East Lake Outfall is expected to attain water quality standards following the implementation of the TMDL for nutrients and BOD_5, in East Lake and East lake Outfall watersheds because the TMDL will require reductions in the two watersheds of 49.6 percent in TN loadings, 52.6 percent in TP loadings, and a 67.7 percent reduction in BOD_5 loadings. The nutrient reductions will result in an annual average reduction in CChl a in East Lake of 60.6% (from 50.79 µg/L to 20.0 µg/L) and a corresponding reduction in algal biomass entering East Lake Outfall. These reductions will significantly improve overall water quality in the watershed, including DO levels. These reductions will have a positive effect on reducing the diurnal fluctuations in DO and will improve the DO levels of water in both the lake and the stream. These reductions in algal biomass (averaging 60.6 percent) will reduce the DO fluctuations and the BOD_5 that results from the breakdown of the algal cells in the lake and stream by a relative amount. As the total BOD is composed of both a carbonaceous fraction and a nitrogenous fraction, additional reductions in BOD will occur as a result of reducing the mass of TN entering the system by 49.6 percent.

6.6 Evaluating Effects of the TMDL on BOD

The elevated BOD_5 measured in both East Lake and East Lake Outfall is contributing to the low DO. These values (as high as 8.3 mg/L) could in part be related to the occasionally high CChl a concentrations measured in the system. Once the external anthropogenic sources of BOD and nutrients from stormwater contributions into the system are reduced through the implementation of the TMDL, it is expected that any remaining DO values below the Class III fresh water criteria can be attributed to pollution (as a result of the man-made conditions) and the stream will attain water quality standards.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

Following the adoption of this TMDL by rule, the Department will determine the best course of action regarding its implementation. Basin Management Action Plans are the primarily mechanism through which TMDLs are implemented in Florida (see Subsection 403.067[7] F.S.). However, other Department-initiated options are available including a decision document and direct NPDES permit modifications. These options are described below. The Department also has the discretion to defer TMDL implementation to a later date if insufficient resources are available to develop an appropriate implementation plan. In some instances where the Department has deferred action, local agencies may work together to develop local implementation plans to meet the TMDL. Such plans should be developed in close consultation with the Department.

7.1 NPDES Permit Modifications

In a case where TMDL requirements are applicable to permitted sources only, the Department may opt to implement the TMDL solely through NPDES permit requirements. This may include modifications to municipal stormwater, domestic wastewater, or industrial wastewater permits. Because of the extent to which nonpoint non-permitted sources (such as agriculture) affect water resources in Florida, this option is unlikely to be used often.

7.2 Decision Document

Absent the need for pollutant reductions to be allocated to specific stakeholders, a decision document may be developed. This implementation approach is applicable if sufficient projects and restoration efforts are ongoing that target the TMDL pollutant of concern such that no additional efforts would be expected of the local stakeholders. This implementation approach documents stakeholder implementation efforts and identifies the expected benefits of such, relative to the TMDL. Developing a decision document instead of a BMAP is appropriate where the universe of projects being implemented is extensive enough that the resources needed for BMAP development would not result in significant additional projects being implemented. No formal action is required of the Department to adopt a decision document.

7.3 Basin Management Action Planw

Basin Management Action Plans (BMAPs) are the most comprehensive approach to TMDL implementation. BMAPs are developed through collaborative processes with the cooperation of local stakeholders and are applicable where multiple sources are affecting a waterbody. Goals of this process are to reach consensus on the scientific foundation, whether or not detailed allocations are necessary and viable, if needed, how detailed allocations will be calculated, and how load reductions will be accomplished.

Once adopted by order of the Department Secretary, BMAPs are enforceable through wastewater and municipal stormwater permits for point sources and through BMP implementation for nonpoint sources. Among other components, BMAPs typically include:

- Water quality goals (based directly on the TMDL);

- Refined source identification;
- Load reduction requirements for stakeholders (quantitative detailed allocations, if technically feasible);
- A description of the load reduction activities to be undertaken, including structural projects, nonstructural BMPs, and public education and outreach;
- A description of further research, data collection, or source identification needed in order to achieve the TMDL;
- Timetables for implementation;
- Implementation funding mechanisms;
- An evaluation of future increases in pollutant loading due to population growth;
- Implementation milestones, project tracking, water quality monitoring, and adaptive management procedures; and
- Stakeholder statements of commitment (typically a local government resolution).

BMAPs are updated through annual meetings and may be officially revised every five years. Completed BMAPs in the state have improved communication and cooperation among local stakeholders and state agencies, improved internal communication within local governments, applied high-quality science and local information in managing water resources, clarified obligations of wastewater point source, MS4 and non-MS4 stakeholders in TMDL implementation, enhanced transparency in DEP decision-making, and built strong relationships between DEP and local stakeholders that have benefitted other program areas. If the Department chooses to move forward with a BMAP, it will be developed through a transparent stakeholder-driven process intended to result in a plan that is cost-effective, technically feasible, and meets the restoration needs of the applicable waterbodies.

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Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as authorized in Chapter 403, F.S., was established as a technology-based program that relies on the implementation of BMPs that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Rule 62-40, F.A.C. In 1994, the Department's stormwater treatment requirements were integrated with the stormwater flood control requirements of the water management districts, along with wetland protection requirements, into the Environmental Resource Permit regulations.

Rule 62-40 also requires the state's water management districts to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a Surface Water Improvement and Management (SWIM) plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka.

In 1987, the U.S. Congress established Section 402(p) as part of the federal Clean Water Act Reauthorization. This section of the law amended the scope of the federal NPDES permitting program to designate certain stormwater discharges as "point sources" of pollution. The EPA promulgated regulations and began implementing the Phase I NPDES stormwater program in 1990. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific standard industrial classification (SIC) codes, construction sites disturbing 5 or more acres of land, and master drainage systems of local governments with a population above 100,000, which are better known as MS4s. However, because the master drainage systems of most local governments in Florida are interconnected, the EPA implemented Phase I of the MS4 permitting program on a countywide basis, which brought in all cities (incorporated areas), Chapter 298 urban water control districts, and the Florida Department of Transportation throughout the 15 counties meeting the population criteria. The Department received authorization to implement the NPDES stormwater program in 2000.

An important difference between the federal NPDES and the state's stormwater/environmental resource permitting programs is that the NPDES Program covers both new and existing discharges, while the state's program focus on new discharges only. Additionally, Phase II of the NPDES Program, implemented in 2003, expands the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 1,000 people. While these urban stormwater discharges are now technically referred to as "point sources" for the purpose of regulation, they are still diffuse sources of pollution that cannot be easily collected and treated by a central treatment facility, as are other point sources of pollution such as domestic and industrial wastewater discharges. It should be noted that all MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs when the implementation plan is formally adopted.

Appendix B: Raw Data for Corrected Chlorophyll a, Biological Oxygen Demand (5-Day), Dissolved Oxygen, Total Nitrogen, Total Phosphorus, and Color

East Lake (WBID 1579A):

Corrected Chlorophyll a:

sta	year	month	day	time	depth	result	Units	rcode
21FLSWFD19295	2006	2	8	1410	0.50	92.49	µg/L	A
21FLSWFD19295	2006	8	14	1515	0.50	79.6	µg/L	A
21FLSWFD19295	2007	2	8	1200	0.50	124.15	µg/L	A
21FLSWFD19295	2007	8	13	1150	0.50	79.29	µg/L	A
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDBELLOWS	2001	8	16	1530	.	38.2	µg/L	
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDSTA0429	1995	7	17	1100	0.50	39.02	µg/L	
21FLSWFDSTA0429	1996	1	23	1050	0.50	78.34	µg/L	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 24030127	2006	2	21	1105	0.20	70	µg/L	A
21FLTPA 24030127	2006	3	21	935	0.20	78	µg/L	
21FLTPA 24030127	2006	4	17	1215	0.20	58	µg/L	
21FLTPA 24030127	2006	5	31	905	0.20	9.1	µg/L	I
21FLTPA 24030127	2006	6	19	950	0.20	4.2	µg/L	U
21FLTPA 24030127	2006	7	18	920	0.20	17	µg/L	
21FLTPA 24030127	2006	9	5	945	0.20	50	µg/L	A
21FLTPA 24030127	2006	9	18	950	0.20	51	µg/L	A
21FLTPA 24030127	2006	10	16	1125	0.20	31	µg/L	
21FLTPA 24030127	2006	11	27	955	0.20	50	µg/L	A
21FLTPA 24030127	2006	12	4	1235	0.20	43	µg/L	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 275919108222353	2006	2	21	1125	0.20	53	µg/L	
21FLTPA 275919108222353	2006	3	21	950	0.20	78	µg/L	A
21FLTPA 275919108222353	2006	4	17	1240	0.20	56	µg/L	
21FLTPA 275919108222353	2006	5	31	920	0.20	22	µg/L	
21FLTPA 275919108222353	2006	6	19	930	0.20	29	µg/L	A
21FLTPA 275919108222353	2006	7	18	935	0.20	35	µg/L	A
21FLTPA 275919108222353	2006	9	5	930	0.20	59	µg/L	

21FLTPA 275919108222353	2006	9	18	930	0.20	70	µg/L	
21FLTPA 275919108222353	2006	10	16	1115	0.20	11	µg/L	I
21FLTPA 275919108222353	2006	11	27	930	0.20	59	µg/L	
21FLTPA 275919108222353	2006	12	4	1305	0.20	71	µg/L	A

Biological Oxygen Demand (5-Day):

sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 24030127	1998	8	25	1145	1.00	8	mg/l	
21FLTPA 24030127	2002	10	8	1130	0.20	4	mg/l	
21FLTPA 24030127	2006	2	21	1105	0.20	7.1	mg/l	
21FLTPA 24030127	2006	3	21	935	0.20	4.6	mg/l	
21FLTPA 24030127	2006	4	17	1215	0.20	5.5	mg/l	
21FLTPA 24030127	2006	5	31	905	0.20	3.1	mg/l	
21FLTPA 24030127	2006	6	19	950	0.20	5.2	mg/l	
21FLTPA 24030127	2006	7	18	920	0.20	5.7	mg/l	
21FLTPA 24030127	2006	9	5	945	0.20	4.2	mg/l	
21FLTPA 24030127	2006	9	18	950	0.20	5.2	mg/l	
21FLTPA 24030127	2006	10	16	1125	0.20	6.1	mg/l	
21FLTPA 24030127	2006	11	27	955	0.20	4.9	mg/l	
21FLTPA 24030127	2006	12	4	1235	0.20	6.9	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 275919108222353	2006	2	21	1125	0.20	8.3	mg/l	
21FLTPA 275919108222353	2006	3	21	950	0.20	4.8	mg/l	
21FLTPA 275919108222353	2006	4	17	1240	0.20	7.4	mg/l	
21FLTPA 275919108222353	2006	5	31	920	0.20	2.8	mg/l	A
21FLTPA 275919108222353	2006	6	19	930	0.20	5.4	mg/l	
21FLTPA 275919108222353	2006	7	18	935	0.20	5.5	mg/l	
21FLTPA 275919108222353	2006	9	5	930	0.20	5.4	mg/l	
21FLTPA 275919108222353	2006	9	18	930	0.20	6.1	mg/l	
21FLTPA 275919108222353	2006	10	16	1115	0.20	6.4	mg/l	
21FLTPA 275919108222353	2006	11	27	930	0.20	4.8	mg/l	
21FLTPA 275919108222353	2006	12	4	1305	0.20	7	mg/l	

Dissolved Oxygen:

sta	year	month	day	time	depth	result	Units	rcode
21FLSWFD19295	2006	2	8	1410	0.50	10.61	mg/l	
21FLSWFD19295	2006	2	8	1411	1.15	10.29	mg/l	
21FLSWFD19295	2006	8	14	1515	0.50	11.81	mg/l	
21FLSWFD19295	2006	8	14	1516	1.18	9.96	mg/l	
21FLSWFD19295	2007	2	8	1200	0.50	9.81	mg/l	
21FLSWFD19295	2007	2	8	1201	1.10	9.41	mg/l	
21FLSWFD19295	2007	2	8	1202	2.00	0.66	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDBELLOWS	2001	8	16	1530	.	11.19	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDSTA0429	1995	7	17	2500	0.50	8.28	mg/l	
21FLSWFDSTA0429	1995	7	17	2500	2.00	8.15	mg/l	
21FLSWFDSTA0429	1996	1	23	2500	0.50	11.35	mg/l	
21FLSWFDSTA0429	1996	1	23	2500	1.00	11.28	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 24030127	2002	10	8	1130	0.20	10.5	mg/l	
21FLTPA 24030127	2006	2	21	1105	0.20	13.9	mg/l	
21FLTPA 24030127	2006	3	21	935	0.20	9.63	mg/l	
21FLTPA 24030127	2006	4	17	1215	0.20	10.35	mg/l	
21FLTPA 24030127	2006	5	31	905	0.20	7.4	mg/l	
21FLTPA 24030127	2006	6	19	950	0.20	8.54	mg/l	
21FLTPA 24030127	2006	10	16	1125	0.20	9.18	mg/l	
21FLTPA 24030127	2006	12	4	1235	0.20	10.47	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 275919108222353	2006	2	21	1125	0.20	12.95	mg/l	
21FLTPA 275919108222353	2006	3	21	950	0.20	9.95	mg/l	
21FLTPA 275919108222353	2006	4	17	1240	0.20	8.96	mg/l	
21FLTPA 275919108222353	2006	5	31	920	0.20	7.37	mg/l	
21FLTPA 275919108222353	2006	6	19	930	0.20	7.25	mg/l	
21FLTPA 275919108222353	2006	7	18	935	0.20	6.42	mg/l	
21FLTPA 275919108222353	2006	9	5	930	0.20	7.15	mg/l	
21FLTPA 275919108222353	2006	9	18	930	0.20	6.41	mg/l	
21FLTPA 275919108222353	2006	10	16	1115	0.20	8.96	mg/l	
21FLTPA 275919108222353	2006	11	27	930	0.20	9.86	mg/l	
21FLTPA 275919108222353	2006	12	4	1305	0.20	11.06	mg/l	

Total Nitrogen:

sta	year	month	day	time	depth	result	Units	rcode
21FLSWFD19295	2006	2	8	1410	0.50	2.14	mg/l	
21FLSWFD19295	2006	8	14	1515	0.50	2.36	mg/l	
21FLSWFD19295	2007	2	8	1200	0.50	2.71	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDBELLOWS	2001	8	16	1530	.	1.27	mg/l	Q
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDSTA0429	1995	7	17	1100	0.50	2.79	mg/l	
21FLSWFDSTA0429	1996	1	23	1050	0.50	0.64	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 24030127	2006	2	21	1105	0.20	2.46	mg/l	+
21FLTPA 24030127	2006	3	21	935	0.20	3.414	mg/l	+
21FLTPA 24030127	2006	4	17	1215	0.20	2.222	mg/l	+
21FLTPA 24030127	2006	5	31	905	0.20	2.004	mg/l	+
21FLTPA 24030127	2006	6	19	950	0.20	2.104	mg/l	+
21FLTPA 24030127	2006	7	18	920	0.20	1.504	mg/l	+
21FLTPA 24030127	2006	9	5	945	0.20	2.004	mg/l	+
21FLTPA 24030127	2006	9	18	950	0.20	2.106	mg/l	+
21FLTPA 24030127	2006	10	16	1125	0.20	1.704	mg/l	+
21FLTPA 24030127	2006	11	27	955	0.20	1.106	mg/l	+
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 275919108222353	2006	2	21	1125	0.20	2.761	mg/l	+
21FLTPA 275919108222353	2006	3	21	950	0.20	2.812	mg/l	+
21FLTPA 275919108222353	2006	4	17	1240	0.20	2.922	mg/l	+
21FLTPA 275919108222353	2006	5	31	920	0.20	2.607	mg/l	+
21FLTPA 275919108222353	2006	6	19	930	0.20	1.904	mg/l	+
21FLTPA 275919108222353	2006	7	18	935	0.20	1.204	mg/l	+
21FLTPA 275919108222353	2006	9	5	930	0.20	2.104	mg/l	+
21FLTPA 275919108222353	2006	9	18	930	0.20	2.004	mg/l	+
21FLTPA 275919108222353	2006	10	16	1115	0.20	2.004	mg/l	+
21FLTPA 275919108222353	2006	11	27	930	0.20	1.308	mg/l	+

Total Phosphorus:

sta	year	month	day	time	depth	result	Units	rcode
21FLSWFD19295	2006	2	8	1410	0.50	0.02	mg/l	I
21FLSWFD19295	2006	8	14	1515	0.50	0.027	mg/l	I
21FLSWFD19295	2007	2	8	1200	0.50	0.105	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDBELLOWS	2001	8	16	1530	.	0.005	mg/l	T
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDSTA0429	1995	7	17	1100	0.50	0.111	mg/l	
21FLSWFDSTA0429	1996	1	23	1050	0.50	0.019	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 24030127	2006	2	21	1105	0.20	0.1	mg/l	
21FLTPA 24030127	2006	3	21	935	0.20	0.13	mg/l	
21FLTPA 24030127	2006	4	17	1215	0.20	0.12	mg/l	
21FLTPA 24030127	2006	5	31	905	0.20	0.091	mg/l	
21FLTPA 24030127	2006	6	19	950	0.20	0.095	mg/l	A
21FLTPA 24030127	2006	7	18	920	0.20	0.054	mg/l	I
21FLTPA 24030127	2006	9	5	945	0.20	0.076	mg/l	
21FLTPA 24030127	2006	9	18	950	0.20	0.077	mg/l	
21FLTPA 24030127	2006	10	16	1125	0.20	0.079	mg/l	
21FLTPA 24030127	2006	11	27	955	0.20	0.04	mg/l	I
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 275919108222353	2006	2	21	1125	0.20	0.11	mg/l	
21FLTPA 275919108222353	2006	3	21	950	0.20	0.12	mg/l	
21FLTPA 275919108222353	2006	4	17	1240	0.20	0.17	mg/l	
21FLTPA 275919108222353	2006	5	31	920	0.20	0.11	mg/l	
21FLTPA 275919108222353	2006	6	19	930	0.20	0.11	mg/l	
21FLTPA 275919108222353	2006	7	18	935	0.20	0.052	mg/l	I
21FLTPA 275919108222353	2006	9	5	930	0.20	0.086	mg/l	
21FLTPA 275919108222353	2006	9	18	930	0.20	0.071	mg/l	
21FLTPA 275919108222353	2006	10	16	1115	0.20	0.072	mg/l	
21FLTPA 275919108222353	2006	11	27	930	0.20	0.044	mg/l	I

Color:

sta	year	month	day	time	depth	result	Units	rcode
21FLSWFD19295	2006	2	8	1410	0.50	30	PCU	
21FLSWFD19295	2006	8	14	1515	0.50	30	PCU	
21FLSWFD19295	2007	2	8	1200	0.50	20	PCU	I
21FLSWFD19295	2007	8	13	1150	0.50	40	PCU	I
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDBELLOWS	2001	8	16	1530	.	15	PCU	I
sta	year	month	day	time	depth	result	Units	rcode
21FLSWFDSTA0429	1995	7	17	1100	0.50	20	PCU	
21FLSWFDSTA0429	1996	1	23	1050	0.50	20	PCU	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 24030127	2002	10	8	1130	0.20	60	PCU	
21FLTPA 24030127	2006	2	21	1105	0.20	70	PCU	
21FLTPA 24030127	2006	3	21	935	0.20	60	PCU	
21FLTPA 24030127	2006	4	17	1215	0.20	80	PCU	
21FLTPA 24030127	2006	5	31	905	0.20	80	PCU	
21FLTPA 24030127	2006	6	19	950	0.20	60	PCU	
21FLTPA 24030127	2006	7	18	920	0.20	60	PCU	
21FLTPA 24030127	2006	9	5	945	0.20	60	PCU	
21FLTPA 24030127	2006	9	18	950	0.20	80	PCU	
21FLTPA 24030127	2006	10	16	1125	0.20	60	PCU	
21FLTPA 24030127	2006	11	27	955	0.20	80	PCU	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 275919108222353	2006	2	21	1125	0.20	70	PCU	
21FLTPA 275919108222353	2006	3	21	950	0.20	80	PCU	
21FLTPA 275919108222353	2006	4	17	1240	0.20	80	PCU	
21FLTPA 275919108222353	2006	5	31	920	0.20	80	PCU	
21FLTPA 275919108222353	2006	6	19	930	0.20	60	PCU	
21FLTPA 275919108222353	2006	7	18	935	0.20	60	PCU	
21FLTPA 275919108222353	2006	9	5	930	0.20	60	PCU	
21FLTPA 275919108222353	2006	9	18	930	0.20	80	PCU	
21FLTPA 275919108222353	2006	10	16	1115	0.20	60	PCU	
21FLTPA 275919108222353	2006	11	27	930	0.20	80	PCU	

East Lake Outfall (WBID 1579):

Corrected Chlorophyll a:

sta	year	month	day	time	depth	result	Units	rcode
21FLGW 22067	2004	8	23	1215	0.20	26	µg/L	A
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27583848221553	2005	2	28	1330	0.20	93	µg/L	
21FLTPA 27583848221553	2005	4	5	900	0.20	2.8	µg/L	U
21FLTPA 27583848221553	2005	6	13	1205	0.10	39	µg/L	A
21FLTPA 27583848221553	2005	8	15	1105	0.20	17	µg/L	
21FLTPA 27583848221553	2005	8	29	945	0.20	70	µg/L	
21FLTPA 27583848221553	2005	10	11	1130	0.20	58	µg/L	
21FLTPA 27583848221553	2005	11	8	1235	0.20	23	µg/L	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 2758546822297	2005	2	28	1350	0.20	97	µg/L	
21FLTPA 2758546822297	2005	4	5	915	0.20	6.1	µg/L	
21FLTPA 2758546822297	2005	6	13	1150	0.10	54	µg/L	A
21FLTPA 2758546822297	2005	8	15	1035	0.20	29	µg/L	
21FLTPA 2758546822297	2005	8	29	930	0.20	70	µg/L	
21FLTPA 2758546822297	2005	10	11	1055	0.20	67	µg/L	
21FLTPA 2758546822297	2005	11	8	1200	0.20	48	µg/L	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27591538222229	2005	2	28	1400	0.20	64	µg/L	A
21FLTPA 27591538222229	2005	4	5	925	0.20	46	µg/L	A
21FLTPA 27591538222229	2005	6	13	1130	0.10	35	µg/L	
21FLTPA 27591538222229	2005	8	15	1050	0.20	60	µg/L	A
21FLTPA 27591538222229	2005	8	29	910	0.20	16	µg/L	
21FLTPA 27591538222229	2005	10	11	1110	0.20	90	µg/L	A
21FLTPA 27591538222229	2005	11	1	1020	0.20	62	µg/L	
21FLTPA 27591538222229	2005	11	8	1215	0.20	64	µg/L	

Biological Oxygen Demand (5-Day):

sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27583848221553	2005	2	28	1330	0.20	4.1	mg/l	A
21FLTPA 27583848221553	2005	4	5	900	0.20	2.7	mg/l	
21FLTPA 27583848221553	2005	6	13	1205	0.10	3.1	mg/l	
21FLTPA 27583848221553	2005	8	15	1105	0.20	1.8	mg/l	I
21FLTPA 27583848221553	2005	8	29	945	0.20	3.6	mg/l	
21FLTPA 27583848221553	2005	10	11	1130	0.20	3.2	mg/l	
21FLTPA 27583848221553	2005	11	8	1235	0.20	1.8	mg/l	I
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 2758546822297	2005	2	28	1350	0.20	4.7	mg/l	
21FLTPA 2758546822297	2005	4	5	915	0.20	1.5	mg/l	I
21FLTPA 2758546822297	2005	6	13	1150	0.10	3.8	mg/l	
21FLTPA 2758546822297	2005	8	15	1035	0.20	2.2	mg/l	
21FLTPA 2758546822297	2005	8	29	930	0.20	4.1	mg/l	
21FLTPA 2758546822297	2005	10	11	1055	0.20	4	mg/l	
21FLTPA 2758546822297	2005	11	8	1200	0.20	2.5	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27591538222229	2005	2	28	1400	0.20	4.2	mg/l	
21FLTPA 27591538222229	2005	4	5	925	0.20	2.5	mg/l	A
21FLTPA 27591538222229	2005	6	13	1130	0.10	4	mg/l	
21FLTPA 27591538222229	2005	8	15	1050	0.20	3	mg/l	
21FLTPA 27591538222229	2005	8	29	910	0.20	2.1	mg/l	
21FLTPA 27591538222229	2005	10	11	1110	0.20	4.3	mg/l	
21FLTPA 27591538222229	2005	11	1	1020	0.20	3.4	mg/l	
21FLTPA 27591538222229	2005	11	8	1215	0.20	3.3	mg/l	

Dissolved Oxygen:

sta	year	month	day	time	depth	result	Units	rcode
21FLGW 22067	2004	8	23	1215	0.20	5.66	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27583848221553	2005	2	28	1330	0.20	7.41	mg/l	
21FLTPA 27583848221553	2005	4	5	900	0.20	3.18	mg/l	
21FLTPA 27583848221553	2005	6	13	1205	0.10	6.32	mg/l	
21FLTPA 27583848221553	2005	8	15	1105	0.20	5.26	mg/l	
21FLTPA 27583848221553	2005	8	29	945	0.20	5.62	mg/l	
21FLTPA 27583848221553	2005	10	11	1130	0.10	6.57	mg/l	
21FLTPA 27583848221553	2005	11	8	1235	0.20	7.41	mg/l	
21FLTPA 27583848221553	2008	11	13	1015	0.20	6.12	mg/l	
21FLTPA 27583848221553	2008	11	20	1010	0.20	5.9	mg/l	
21FLTPA 27583848221553	2008	12	4	1115	0.10	2.15	mg/l	
21FLTPA 27583848221553	2008	12	11	1110	0.20	8.11	mg/l	
21FLTPA 27583848221553	2008	12	18	1040	0.15	3.65	mg/l	
21FLTPA 27583848221553	2009	1	7	1040	0.10	2.3	mg/l	
21FLTPA 27583848221553	2009	1	14	1235	0.10	2.48	mg/l	
21FLTPA 27583848221553	2009	1	21	1250	0.10	2.98	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 2758546822297	2005	2	28	1350	0.20	2.77	mg/l	
21FLTPA 2758546822297	2005	4	5	915	0.20	2.8	mg/l	
21FLTPA 2758546822297	2005	6	13	1150	0.10	4.97	mg/l	
21FLTPA 2758546822297	2005	8	15	1035	0.20	2.25	mg/l	
21FLTPA 2758546822297	2005	8	29	930	0.20	3.19	mg/l	
21FLTPA 2758546822297	2005	10	11	1055	0.20	4.92	mg/l	
21FLTPA 2758546822297	2005	11	8	1200	0.20	3.45	mg/l	
21FLTPA 2758546822297	2008	11	13	1005	0.20	2.95	mg/l	
21FLTPA 2758546822297	2008	11	20	950	0.20	6.12	mg/l	
21FLTPA 2758546822297	2008	12	4	1050	0.10	2.31	mg/l	
21FLTPA 2758546822297	2008	12	11	1040	0.20	7.19	mg/l	
21FLTPA 2758546822297	2008	12	18	1030	0.15	3.27	mg/l	
21FLTPA 2758546822297	2009	1	7	1025	0.10	3.23	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27591538222229	2005	2	28	1400	0.20	1.51	mg/l	
21FLTPA 27591538222229	2005	4	5	925	0.20	1.93	mg/l	
21FLTPA 27591538222229	2005	6	13	1130	0.10	5.57	mg/l	
21FLTPA 27591538222229	2005	8	15	1050	0.20	3.38	mg/l	
21FLTPA 27591538222229	2005	8	29	910	0.20	3.39	mg/l	
21FLTPA 27591538222229	2005	10	11	1110	0.20	5.23	mg/l	
21FLTPA 27591538222229	2005	11	1	1020	0.20	5.33	mg/l	
21FLTPA 27591538222229	2005	11	8	1215	0.20	5.84	mg/l	
21FLTPA 27591538222229	2008	11	13	955	0.10	4.2	mg/l	
21FLTPA 27591538222229	2008	11	20	1000	0.10	5.57	mg/l	
21FLTPA 27591538222229	2008	12	4	1100	0.10	4.7	mg/l	
21FLTPA 27591538222229	2008	12	11	1055	0.10	5.15	mg/l	

21FLTPA 27591538222229	2008	12	18	1020	0.10	4.75	mg/l	
21FLTPA 27591538222229	2009	1	7	1015	0.20	2.29	mg/l	

Total Nitrogen:

sta	year	month	day	time	depth	result	Units	rcode
21FLGW 22067	2004	8	23	1215	0.20	1.22	mg/l	+
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27583848221553	2005	2	28	1330	0.20	2.204	mg/l	+
21FLTPA 27583848221553	2005	4	5	900	0.20	1.86	mg/l	+
21FLTPA 27583848221553	2005	6	13	1205	0.10	1.804	mg/l	+
21FLTPA 27583848221553	2005	8	15	1105	0.20	1.34	mg/l	+
21FLTPA 27583848221553	2005	8	29	945	0.20	1.148	mg/l	+
21FLTPA 27583848221553	2005	10	11	1130	0.20	1.313	mg/l	+
21FLTPA 27583848221553	2005	11	8	1235	0.20	1.5	mg/l	+
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 2758546822297	2005	2	28	1350	0.20	2.504	mg/l	+
21FLTPA 2758546822297	2005	4	5	915	0.20	2.251	mg/l	+
21FLTPA 2758546822297	2005	6	13	1150	0.10	2.004	mg/l	+
21FLTPA 2758546822297	2005	8	15	1035	0.20	1.42	mg/l	+
21FLTPA 2758546822297	2005	8	29	930	0.20	1.45	mg/l	+
21FLTPA 2758546822297	2005	10	11	1055	0.20	1.807	mg/l	+
21FLTPA 2758546822297	2005	11	8	1200	0.20	1.56	mg/l	+
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27591538222229	2005	2	28	1400	0.20	2.504	mg/l	+
21FLTPA 27591538222229	2005	4	5	925	0.20	2.439	mg/l	+
21FLTPA 27591538222229	2005	6	13	1130	0.10	2.004	mg/l	+
21FLTPA 27591538222229	2005	8	15	1050	0.20	1.84	mg/l	+
21FLTPA 27591538222229	2005	8	29	910	0.20	1.006	mg/l	+
21FLTPA 27591538222229	2005	10	11	1110	0.20	1.604	mg/l	+
21FLTPA 27591538222229	2005	11	1	1020	0.20	1.933	mg/l	+
21FLTPA 27591538222229	2005	11	8	1215	0.20	1.712	mg/l	+

Total Phosphorus:

sta	year	month	day	time	depth	result	Units	rcode
21FLGW 22067	2004	8	23	1215	0.20	0.14	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27583848221553	2005	2	28	1330	0.20	0.21	mg/l	
21FLTPA 27583848221553	2005	4	5	900	0.20	0.42	mg/l	
21FLTPA 27583848221553	2005	6	13	1205	0.10	0.27	mg/l	
21FLTPA 27583848221553	2005	8	15	1105	0.20	0.12	mg/l	
21FLTPA 27583848221553	2005	8	29	945	0.20	0.15	mg/l	
21FLTPA 27583848221553	2005	10	11	1130	0.20	0.089	mg/l	A
21FLTPA 27583848221553	2005	11	8	1235	0.20	0.12	mg/l	A
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 2758546822297	2005	2	28	1350	0.20	0.19	mg/l	
21FLTPA 2758546822297	2005	4	5	915	0.20	0.097	mg/l	
21FLTPA 2758546822297	2005	6	13	1150	0.10	0.17	mg/l	
21FLTPA 2758546822297	2005	8	15	1035	0.20	0.13	mg/l	
21FLTPA 2758546822297	2005	8	29	930	0.20	0.13	mg/l	
21FLTPA 2758546822297	2005	10	11	1055	0.20	0.1	mg/l	
21FLTPA 2758546822297	2005	11	8	1200	0.20	0.12	mg/l	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27591538222229	2005	2	28	1400	0.20	0.17	mg/l	
21FLTPA 27591538222229	2005	4	5	925	0.20	0.1	mg/l	
21FLTPA 27591538222229	2005	6	13	1130	0.10	0.14	mg/l	
21FLTPA 27591538222229	2005	8	15	1050	0.20	0.21	mg/l	A
21FLTPA 27591538222229	2005	8	29	910	0.20	0.26	mg/l	
21FLTPA 27591538222229	2005	10	11	1110	0.20	0.067	mg/l	
21FLTPA 27591538222229	2005	11	1	1020	0.20	0.11	mg/l	
21FLTPA 27591538222229	2005	11	8	1215	0.20	0.079	mg/l	

Color:

sta	year	month	day	time	depth	result	Units	rcode
21FLGW 22067	2004	8	23	1215	0.20	60	PCU	A
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27583848221553	2005	2	28	1330	0.20	100	PCU	
21FLTPA 27583848221553	2005	4	5	900	0.20	100	PCU	
21FLTPA 27583848221553	2005	6	13	1205	0.10	100	PCU	
21FLTPA 27583848221553	2005	8	15	1105	0.20	60	PCU	
21FLTPA 27583848221553	2005	8	29	945	0.20	60	PCU	
21FLTPA 27583848221553	2005	10	11	1130	0.20	80	PCU	
21FLTPA 27583848221553	2005	11	8	1235	0.20	60	PCU	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 2758546822297	2005	2	28	1350	0.20	100	PCU	
21FLTPA 2758546822297	2005	4	5	915	0.20	60	PCU	A
21FLTPA 2758546822297	2005	6	13	1150	0.10	60	PCU	
21FLTPA 2758546822297	2005	8	15	1035	0.20	60	PCU	
21FLTPA 2758546822297	2005	8	29	930	0.20	60	PCU	
21FLTPA 2758546822297	2005	10	11	1055	0.20	100	PCU	
21FLTPA 2758546822297	2005	11	8	1200	0.20	60	PCU	
sta	year	month	day	time	depth	result	Units	rcode
21FLTPA 27591538222229	2005	2	28	1400	0.20	100	PCU	
21FLTPA 27591538222229	2005	4	5	925	0.20	60	PCU	
21FLTPA 27591538222229	2005	6	13	1130	0.10	60	PCU	A
21FLTPA 27591538222229	2005	8	15	1050	0.20	60	PCU	
21FLTPA 27591538222229	2005	8	29	910	0.20	60	PCU	
21FLTPA 27591538222229	2005	10	11	1110	0.20	80	PCU	
21FLTPA 27591538222229	2005	11	1	1020	0.20	60	PCU	
21FLTPA 27591538222229	2005	11	8	1215	0.20	60	PCU	