FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Environmental Assessment and Restoration, Bureau of Watershed Restoration

SOUTH DISTRICT • CHARLOTTE HARBOR BASIN

FINAL TMDL Report
Dissolved Oxygen TMDL for Coral Creek–East Branch (WBID 2078B)

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Acknowledgments

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Florida STORET Program

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

2008 305(b) Report

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

Criteria for Surface Water Quality Classifications

http://www.dep.state.fl.us/water/wqssp/classes.htm

Basin Status Report: Charlotte Harbor

http://www.dep.state.fl.us/water/basin411/charlotte/status.htm

Water Quality Assessment Report: Charlotte Harbor

http://www.dep.state.fl.us/water/basin411/charlotte/assessment.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

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Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for dissolved oxygen (DO) for Coral Creek–East Branch, located in the Lemon Bay Planning Unit within the Charlotte Harbor Basin (**Figure 1.1**). This estuarine stream was verified impaired for DO, and was included on the Verified List of impaired waters for the Charlotte Harbor Basin that was adopted by Secretarial Order on May 19, 2009. The TMDL establishes the allowable loadings of total nitrogen (TN), total phosphorus (TP), and biochemical oxygen demand (BOD) to Coral Creek–East Branch that would restore the waterbody so that it meets its applicable water quality criterion for DO.

1.2 Identification of Waterbody

To provide a more detailed geographic basis for assessing, reporting, and documenting water quality improvement projects, the Florida Department of Environmental Protection (Department) divides basin groups into smaller areas called planning units. Planning units help organize information and management strategies around prominent sub-basin characteristics and drainage features. To the extent possible, planning units were chosen to reflect sub-basins that had previously been defined by the Southwest Florida Water Management District (SWFWMD). Coral Creek–East Branch is located in the Lemon Bay Planning Unit. For assessment purposes, the Department has divided the Lemon Bay Planning Unit into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed. Coral Creek–East Branch is WBID 2078B (**Figure 1.1**).

1.2.1 Coral Creek–East Branch (WBID 2078B)

The Coral Creek–East Branch watershed, located in Charlotte County, encompasses 2,700 acres (**Figure 1.2**). The climate in Charlotte County, specifically areas surrounding the Coral Creek–East Branch watershed, is subtropical, with annual rainfall averaging approximately 49.53 inches, although rainfall amounts can vary greatly from year to year (Climate Information for Management and Operational Decisions [CLIMOD], 2009). Based on data from a 30-year period (1971–2000), the average summer temperature is 91.5^{o}F, and the average winter temperature is 76.3^{o}F (CLIMOD, 2009).

The topography of the Coral Creek–East Branch watershed reflects its location in the Southwestern Florida Flatwoods or Southwestern Coastal Plains ecoregion. Elevations range throughout the watershed from around 5 to 10 feet above sea level (Department, 2008). The predominant soil type is shelly sand and clay (Department, 2008).

The predominant land uses are approximately 1,091 acres of upland forest/rural open, 701 acres of wetlands, and 611 acres of urban and built-up. There are no major human population centers in the watershed.

Figure 1.1. Location of the Coral Creek–East Branch Watershed (WBID 2078B) in the Charlotte Harbor Basin and Major Hydrologic and Geopolitical Features in the Area

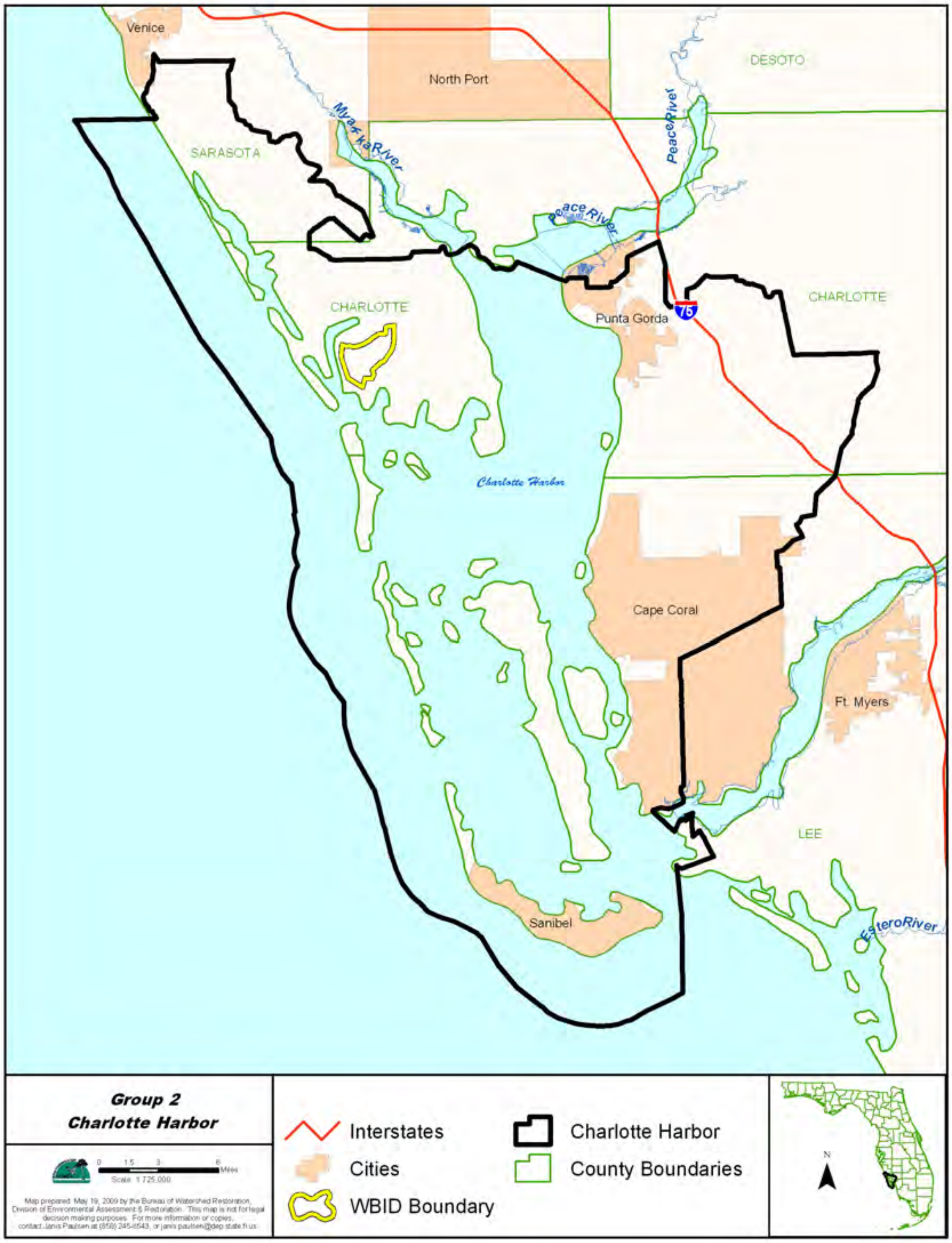


Figure 1.2. Location of the Coral Creek–East Branch Watershed (WBID 2078B) in Charlotte County with Major Hydrologic and Geopolitical Features in the Area

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).

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 (BMAP) to restore the waterbody so that it meets its applicable water quality criterion for DO. These activities will depend heavily on the active participation of the SWFWMD, 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 the 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 contained several waterbodies in the Charlotte Harbor Basin, including Coral Creek–East Branch. 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.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments and has verified the impairments for low DO in Coral Creek–East Branch (**Table 2.1**). **Table 2.2** lists the assessment results for DO following the IWR methodology. WBIDs were verified as impaired for DO based on data that indicated an exceedance rate greater than or equal to 10 percent, with a 90 percent confidence level. The Class III marine water quality criterion is that DO shall not average less than 5.0 milligrams per liter (mg/L) in a 24-hour period and shall never be less than 4.0 mg/L. Normal daily and seasonal fluctuations above these levels shall be maintained.

As part of the listing process, the Department attempts to identify the limiting nutrient or nutrients for the impaired waterbody. The limiting nutrient, generally nitrogen or phosphorus, is defined as the nutrient that limits plant growth when it is not available in sufficient quantities. It is a chemical that is necessary for plant growth, but available in quantities smaller than needed. Once the limiting nutrient in a waterbody is exhausted, algae stop growing. If more of the limiting nutrient is added, larger plant populations will result until nutrients or other environmental factors again limit their growth.

Nutrients stimulate the growth of chlorophyll *a*, which is used as an index, and periphyton. Reductions in nutrient loadings would be expected to result in decreases in algal and periphyton growth. The decay of algal and periphyton biomass also consumes DO. Thus nutrient load reductions would also result in additional benefits for other parameters of concern, including DO and BOD. Bacteria use the dissolved organic carbon (DOC) produced by algae, periphyton, and other aquatic vegetation. The addition of excessive nutrients can stimulate the use of DOC by bacteria, causing their biomass to grow and consume oxygen. Measuring BOD is a chemical procedure for determining the rate of oxygen uptake by microorganisms in a body of water.

Reductions in nutrients will result in lower algal and periphyton biomass levels, and lower algal and periphyton biomass levels will result in smaller diurnal fluctuations in DO, fewer algal-based total suspended solids (TSS), and reduced BOD.

The IWR data were based on samples collected during the verified period (January 1, 2001–June 30, 2008). Specifically, the period of record for the data is February 2007 to December 2007 (**Figure 2.1**). The main source of data for the IWR assessment came from stations sampled by the Department's South District (21FLFTM) (**Figure 2.2**). The Englewood Water District, Sarasota County, Charlotte County Utilities, Charlotte County Health Department, and city of Sanibel were contacted for assistance in determining water quality sampling locations in the Charlotte Harbor Basin. The water quality sampling efforts conducted by the Department's South District in the Charlotte Harbor Basin in 2007 were in response to the basin rotation schedule, which assesses 1 out of 5 basins in the South District each year. The individual water quality measurements used in this analysis are available in the IWR database, and are available upon request.

Coral Creek–East Branch was also verified for DO impairment because 12 out of 28 samples collected in the verified period exceeded the DO criterion. Nitrogen and phosphorus are considered co-limiting nutrients based on a median TN/TP ratio of 17.6 (n=24). In addition, BOD (annual median = 2.35; n=24) is considered the causative pollutant that caused the low DO condition in the creek.

Table 2.1. Verified Impairments for Coral Creek–East Branch (WBID 2078B)

[1] A 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 the EPA by September 30, 2009.

WBID	Waterbody Segment	Parameters Included on the 1998 303(d) List	Parameter Verified for Impairment	Projected Year for TMDL Development[1]
2078B	Coral Creek–East Branch	DO	DO	2008

Table 2.2. Summary of DO Data Collected During the Verified Period (January 1, 2001–June 30, 2008) for Coral Creek–East Branch (WBID 2078B)

Waterbody Segment	Total Number of Samples	IWR-Required Number of Exceedances for the Verified List	Number of Observed Exceedances	Number of Observed Nonexceedances	Number of Seasons Data Were Collected
Coral Creek–East Branch	28	6	12	16	4

Figure 2.1. DO (mg/L) Data in Cycle 2 (Verified Period: January 1, 2001–June 30, 2008)

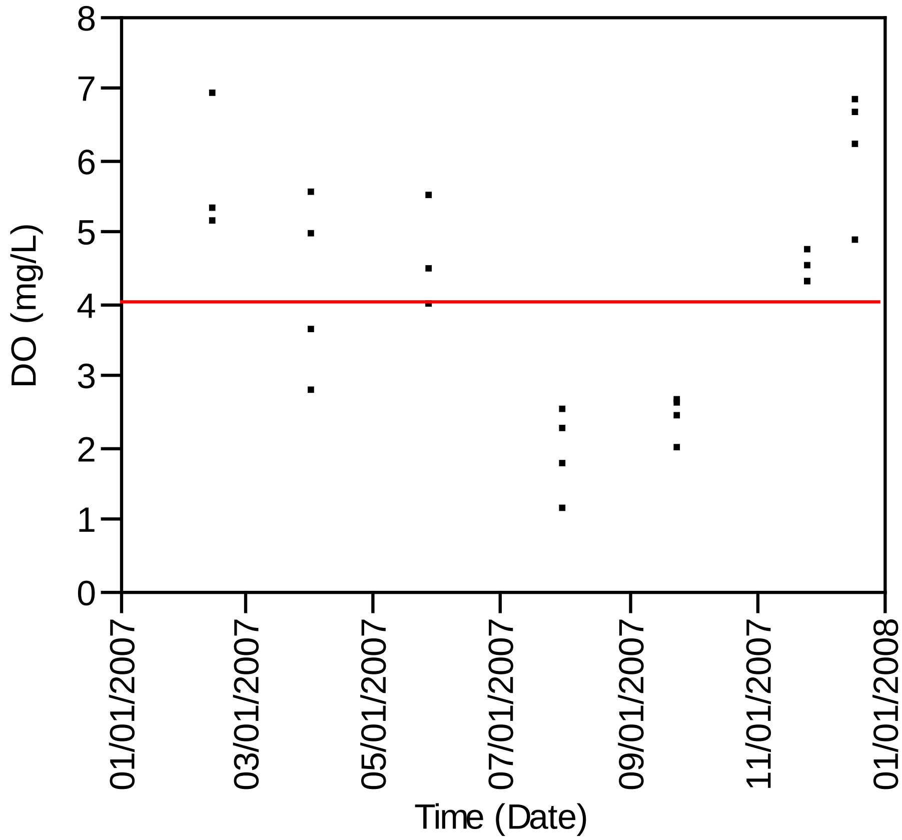


Figure 2.2. Water Quality Sampling Stations in the Coral Creek–East Branch Watershed (WBID 2078B)

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)**

Coral Creek–East Branch is a Class III waterbody, with a designated use of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criterion applicable to the impairment addressed by this TMDL is for DO.

3.2 Applicable Water Quality Standards and Numeric Water Quality Targets

3.2.1 Applicable Water Quality Standard for DO Concentration

Florida's Surface Water Quality Standards require that the DO concentration for Class III marine waters "shall not average less than 5.0 mg/L in a 24-hour period and shall never be less than 4.0 mg/L. Normal daily and seasonal fluctuations above these levels shall be maintained" (Rule 62-302, F.A.C.).

3.2.2 Interpretation of BOD Criterion

Florida's BOD criterion is narrative. For any Class III waterbody, the BOD shall not be increased so as to cause DO to be depressed below the applicable DO criterion, and in no case shall it be great enough to cause nuisance conditions. The existence of elevated BOD (mean and median values greater than 2.0 mg/L) in several of the watersheds being assessed led to the conclusion that BOD levels were a negative influence on DO concentrations. The current method detection limit is 2.0 mg/L for most determinations, which for practical purposes sets a level for determining whether BOD contributes to the depression of DO levels.

3.2.3 Factors that Influence Nutrient Concentrations

Recent data compiled by Harper and Baker (2007) demonstrated that increasing the intensity of land use generally results in increasing nutrient runoff concentration (Harper and Baker, 2007) and an increase in runoff volume (Harper and Baker, 2007). Both urbanization and the increasing intensity of agricultural land use (e.g., conversion from rangeland to a managed pasture) can increase the delivery of nutrients to local receiving waters. Specific agricultural activities that can contribute to the declining health of the system include water flow changes due to the creation of secondary and tertiary canal systems for use in irrigation and flood control, and the introduction of nutrients via fertilization. Urbanization can result in the reduction of pervious areas for runoff infiltration, contributing significantly to increased runoff and nutrient loading (Harper and Baker, 2007). Other activities associated with urbanization also increase nutrient inputs, including the installation of septic tanks, sewage overflows, fertilizer usage, and the use of irrigation quality water in sprinkler systems in golf courses and new housing developments. The impact of agricultural and urban activities on the eutrophication of receiving waters can be decreased through the implementation of best management practices (BMPs).

3.2.4 Factors That Influence DO

The availability of DO in a marine or freshwater system is highly variable due to several factors. Oxygen is produced in the water column by photosynthesis and is consumed by the respiration of plants, animals, and aerobic bacteria, and by chemical reactions that occur in brackish waters due to the interaction of sunlight, humic and fulvic materials, and oxidation and reduction reactions. The ability of a system to absorb oxygen from the atmosphere depends on flow factors such as water depth and turbulence. Elevated nitrogen and phosphorus compounds contribute to excess algae growth. Under high nutrient levels, algae grow rapidly and raise DO concentrations during daylight hours. Respiration by the dense algal populations and other consumers reduce DO concentrations during the night. When phytoplankton cells die, they sink towards the bottom and are decomposed by bacteria, a process (i.e., sediment oxygen demand [SOD]) that further reduces DO in the water column.

As mentioned above, factors that may cause significant oxygen depletion include BOD and SOD. BOD, including carbonaceous BOD (CBOD) and nitrogenous BOD (NBOD), may be the product of both naturally occurring oxygen use from the decomposition of organic materials, and the stabilization of waste products associated with nonpoint source runoff. The significance of any of these factors depends on the specific stream conditions.

BOD related to microorganisms is called CBOD. The source material for CBOD is organic matter. CBOD results when microorganisms consume oxygen in converting organic material into carbon dioxide (CO_2), water (H_20), nutrients, energy, and new cells. Algal cells contain organic chemicals that consume oxygen during decomposition.

BOD related to chemical oxidation is called NBOD. The source materials for NBOD include organic matter that decays to ammonia, and ammonia entering the system through stormwater systems or runoff. Nitrification, the process of oxidizing ammonia to nitrates by microorganisms, requires almost 5 mg/L of DO (NBOD) for every milligram per liter of ammonia that is oxidized.

SOD is the overall demand for DO from the water column that is exerted by the combination of biological, biochemical, and chemical processes at the sediment-water interface. The primary sources of SOD are anaerobic (low-oxygen) chemical compounds in riverbed sediments and particulate BOD (including algae and other sources of organic matter) that settle out of the water column. SOD is generally composed of biological respiration from benthic organisms and the biochemical (i.e., bacterial) decay processes in the top layer of deposited sediments. In addition to DO depletion, the degradation of organic matter in the sediment results in the release of oxygen-demanding (i.e., oxygen-reducing) nutrients, metals, ammonium, iron, manganese, sulfide, and ammonia (Price et al., 1994). These soluble chemicals are released into the water and exert a relatively rapid (i.e., over a period of hours) oxygen demand as the reduced chemicals are oxidized. Some oxidation processes, such as the nitrification of ammonia to nitrate, require bacteria and may be slower (i.e., days). In stratified waters, the sediment and the bottom layer of water are somewhat "trapped" and the oxygen is depleted as a result of the decay of organic matter and lack of exchange of oxygenated water from upper layers (EPA, 2007). Estuarine waters are often considered to be stratified.

3.2.5 Seasonal Influences

Temporal Patterns

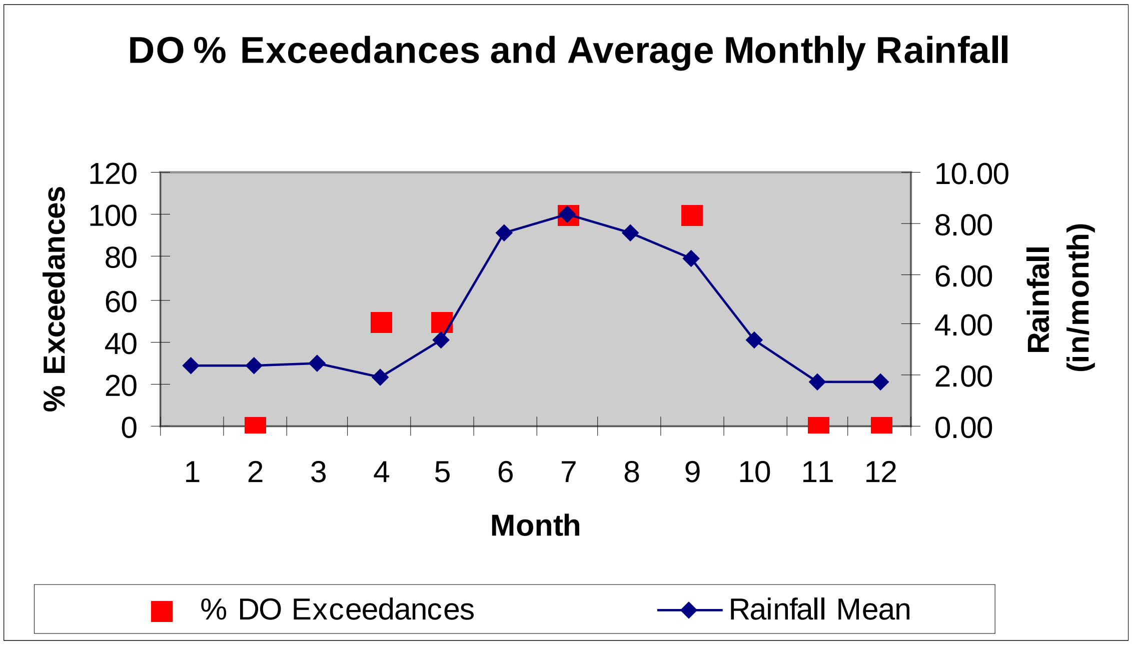
Measurements were sorted by month to determine whether there was a temporal pattern of exceedances. Monthly average rainfall data from Punta Gorda, Florida (087397), for Coral Creek–East Branch were obtained and included in the analysis. **Table 3.1** provides summary statistics by month for DO and rainfall measurements, and **Figure 3.1** contains a graphical representation. As shown in **Figure 3.1**, average monthly rainfall values increased in May (mean = 3.42 inches), reaching a peak in July (mean = 8.31 inches), and decreased to the annual winter minimum in November (mean = 1.76 inches). A 100 percent exceedance rate of the DO criterion in Coral Creek–East Branch was observed during high-rainfall events.

Table 3.1. Summary Statistics of DO and Rainfall Data for Coral Creek–East Branch (WBID 1078B) by Month

= Empty cell/no data

Month	Number of Cases	Minimum (mg/L)	Maximum (mg/L)	Median (mg/L)	Mean (mg/L)	Number of Exceedances	% DO Exceedances	Rainfall Mean (inches)
1	-	-	-	-	-	-	-	2.35
2	4	5.09	6.9	5.29	5.76	0	0%	2.36
3	-	-	-	-	-	-	-	2.47
4	4	2.76	5.5	4.25	4.19	2	50%	1.90
5	4	3.94	5.46	4.19	4.44	2	50%	3.42
6	-	-	-	-	-	-	-	7.63
7	4	1.09	2.51	1.98	1.89	4	100%	8.31
8	-	-	-	-	-	-	-	7.61
9	4	1.97	2.63	2.48	2.39	4	100%	6.58
10	-	-	-	-	-	-	-	3.36
11	4	4.27	4.73	4.38	4.44	0	0%	1.76
12	4	4.84	6.81	6.39	6.11	0	0%	1.78

Figure 3.1. DO Percent Exceedances and Average Monthly Rainfall for Coral Creek–East Branch (WBID 2078B)



Define the Critical Period

The critical period for nutrient (nitrogen and phosphorus) loadings in a given watershed depends on many factors, including the presence of point sources and the land use pattern in the watershed. Typically, the critical period for nonpoint sources is an extended dry period followed by a rainfall runoff event. During the wet weather period, rainfall washes off nutrients that have built up on the land surface under dry conditions, resulting in the wet weather exceedances.

Based on the predominant land use types (urban/built-up and upland forest/rural open land) in this watershed, it is likely that many of the exceedances stem from nutrients in nonpoint sources and municipal separate storm sewer systems (MS4s) entering the waters through surface runoff. This could indicate that nitrogen and phosphorus build up on the land during dry periods and wash off into local waters during rain events.

In Coral Creek–East Branch, plotting DO data against time (date) (**Figure 2.1**) revealed a critical period from May through November. In May, DO levels had a median value of 4.20 (mean = 4.44), decreased in July (median = 2.44; mean = 1.89) and September (median = 2.48; mean = 2.39), and increased in November to a median value of 4.38 (mean = 4.44) (see **Table 3.2**). Similarly, the plot of DO percent exceedances against average monthly rainfall revealed a 50 percent exceedance rate of the DO criterion in Coral Creek–East Branch in May and November, and a 100 percent exceedance rate in July and September. DO does not respond to nutrient (TN and TP) changes instantly. In south Florida, where Coral Creek–East Branch is located, May through November is also the wet season.

3.2.6 DO Is Inversely Related to TN, TP, and BOD

Nutrients stimulate periphyton and chlorophyll *a* growth, lowering DO concentrations in a waterbody. Reductions in nutrient loadings would be expected to decrease algal and periphyton growth, and result in lower DO. The decay of algal and periphyton biomass also consumes DO. Thus nutrient load reductions are expected to result in additional benefits for other parameters of concern, including DO and BOD.

Bacteria use the DOC produced by algae, periphyton, and other aquatic vegetation. The addition of excessive nutrients can stimulate the use of DOC by bacteria, causing their biomass to grow and consume oxygen. BOD is a measure for determining the rate of oxygen uptake by microorganisms in a body of water. DO is inversely related to nutrients (nitrogen and phosphorus) and BOD. Reductions in nutrients and BOD will result in lower algal and periphyton biomass levels, and lower algal and periphyton biomass levels will result in smaller diurnal fluctuations in DO, and fewer algal-based TSS.

In Coral Creek–East Branch, when DO concentrations decreased and then increased during the critical period (wet season: May through November), the opposite was observed for TN, TP, and BOD concentrations, which increased and then decreased during the critical period (see **Table 3.2**). DO is inversely related to nutrients (nitrogen and phosphorus) and BOD. Plots during the critical period (wet season: May through November) of DO against TN, TP, and BOD resulted in an R^2 of 0.66 and a p-value of 0.0001 (**Figure 3.2**), an R^2 of 0.86 and a p-value of 0.0001 (**Figure 3.3**), and an R^2 of 0.37 and a p-value of 0.01 (**Figure 3.4**), respectively.

Table 3.2. Monthly Medians and Means for DO, TN, TP, and BOD in Coral Creek–East Branch (WBID 2078B) during the Critical Period (Wet Season: May through November)

Month	Median DO (mg/L)	Median TN (mg/L)	Median TP (mg/L)	Median BOD (mg/L)	Mean DO (mg/L)	Mean TN (mg/L)	Mean TP (mg/L)	Mean BOD (mg/L)
May	4.19	0.72	0.040	1.70	4.44	0.69	0.037	1.80
July	1.98	0.97	0.072	2.55	1.89	0.99	0.072	2.70
September	2.48	1.20	0.063	3.00	2.39	1.18	0.065	3.00
November	4.38	0.73	0.045	1.40	4.44	0.74	0.044	1.40

Figure 3.2. DO v. TN Data during the Critical Period (Wet Season: May through November)

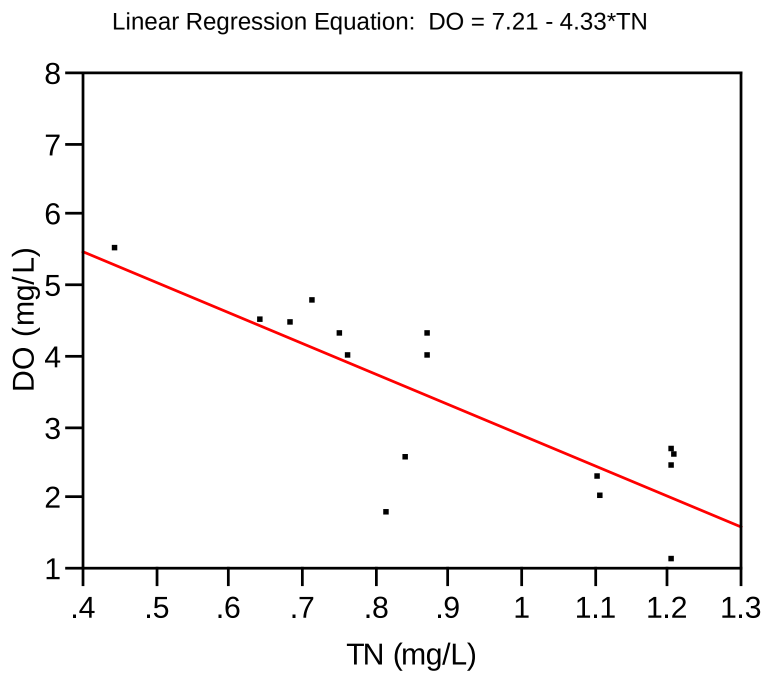


Figure 3.3. DO v. TP Data during the Critical Period (Wet Season: May through November)

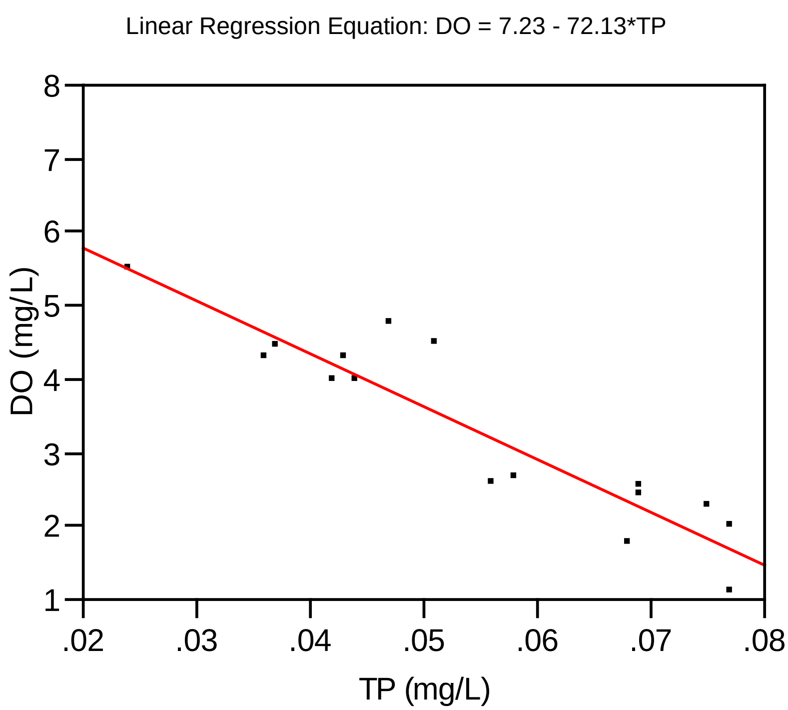
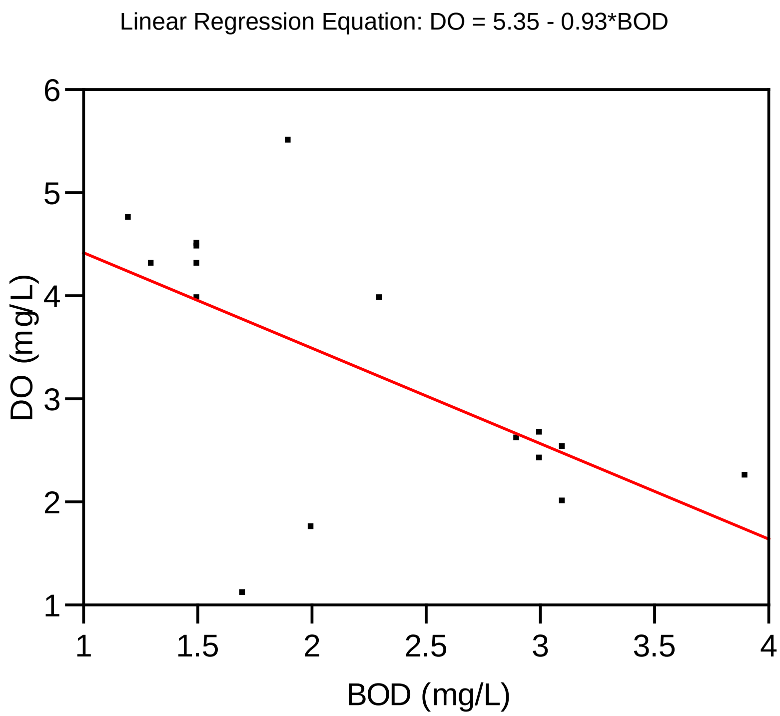


Figure 3.4. DO v. BOD Data during the Critical Period (Wet Season: May through November)



3.2.7 Numeric Water Quality Targets

BOD

Florida's BOD criterion is narrative. For any Class III waterbody, the BOD shall not be increased so as to cause DO to be depressed below the applicable DO criterion, and in no case shall it be great enough to cause nuisance conditions. The existence of elevated BOD (mean and median values greater than 2.0 mg/L) in several of the watersheds being assessed led to the conclusion that BOD levels negatively influenced DO concentrations. The current method detection limit is 2.0 mg/L for most determinations, which for practical purposes sets a water quality TMDL target level of 2.0 mg/L for determining whether BOD contributes to the depression of DO levels.

TN

A region-based reference concentration approach could not be used for setting a water quality TMDL target in Coral Creek–East Branch because other waterbodies in the Lemon Bay Planning Unit with similar land uses, anthropogenic inputs, and watersheds are also impaired for low DO. Therefore, a linear regression approach was selected for TN TMDL target development. Using the linear regression equation DO against TN (Eq. DO = 7.21 - 4.33*TN), if DO is set to equal 4.0 mg/L, which is the minimum DO criterion for Class III marine waterbodies, then TN is equal to or less than 0.74 mg/L. According to the linear regression equation, if TN values exceed 0.74 mg/L, DO levels less than 4.0 mg/L will be observed. Therefore, the water quality TMDL target for TN is 0.74 mg/L during the critical period (May through November). The target may seem low but is attainable based on monthly median values of 0.72 and 0.73 mg/L in May and November, respectively.

TP

Similarly, for TP, a region-based reference concentration approach could not be used for target development; therefore, a linear regression approach was also selected for TP TMDL target development. Using the linear regression equation DO against TP (Eq. DO = 7.23 - 72.13*TP), if DO is set to equal 4.0 mg/L, which is the DO criterion for Class III marine waterbodies, then TP is equal to or less than 0.044 mg/L. According to the linear regression equation, if TP values exceed 0.044 mg/L, DO levels less than 4.0 mg/L will be observed. Thus the water quality TMDL target for TP is 0.044 mg/L during the critical period (May through November). The target may also seem low but is attainable based on monthly median values of 0.040 and 0.045 mg/L in May and November, respectively.

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 nutrients in the Coral Creek–East Branch watershed and the amount of pollutant loading 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, such as 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 in the Coral Creek–East Branch Watershed

4.2.1 Point Sources

NPDES Wastewater Facilities

There are no NPDES-permitted wastewater facilities discharging to surface water in the Coral Creek–East Branch watershed.

MS4 Permittees

MS4s permitted under the NPDES stormwater permitting program may discharge nutrients to waterbodies in response to storm events. Charlotte County owns and operates the stormwater collection systems in the Coral Creek–East Branch watershed (#FLR04E043).

4.2.2 Land Uses and Nonpoint Sources

Land Uses

The spatial distribution and acreage of different land use categories were identified using the Florida Land Use, Cover, and Forms Classification System (FLUCCS) and the SWFWMD 2006 land use coverage contained in the Department's geographic information system (GIS) library. Land use categories in the Coral Creek–East Branch watershed were aggregated using the simplified Level 1 codes tabulated in **Table 4.1**. The watershed encompasses 2,700 acres. The predominant land uses are approximately 1,091 acres of upland forest/rural open, 701 acres of wetlands, and 611 acres of urban and built-up. Specifically, medium-density residential is located in the north, northeast, and southwest portions of the WBID. A golf course is located on the southwest side of the watershed at the mouth of Coral Creek–East Branch, and a low-use airstrip is located to the east (**Figure 4.1**).

During high-tide events, watersheds that are tidally influenced, such as Coral Creek–East Branch, can move nutrients (TN and TP) located in the downstream portion of the watershed upstream. However, the potential nutrient effect is unknown and needs further investigation.

Ground Water

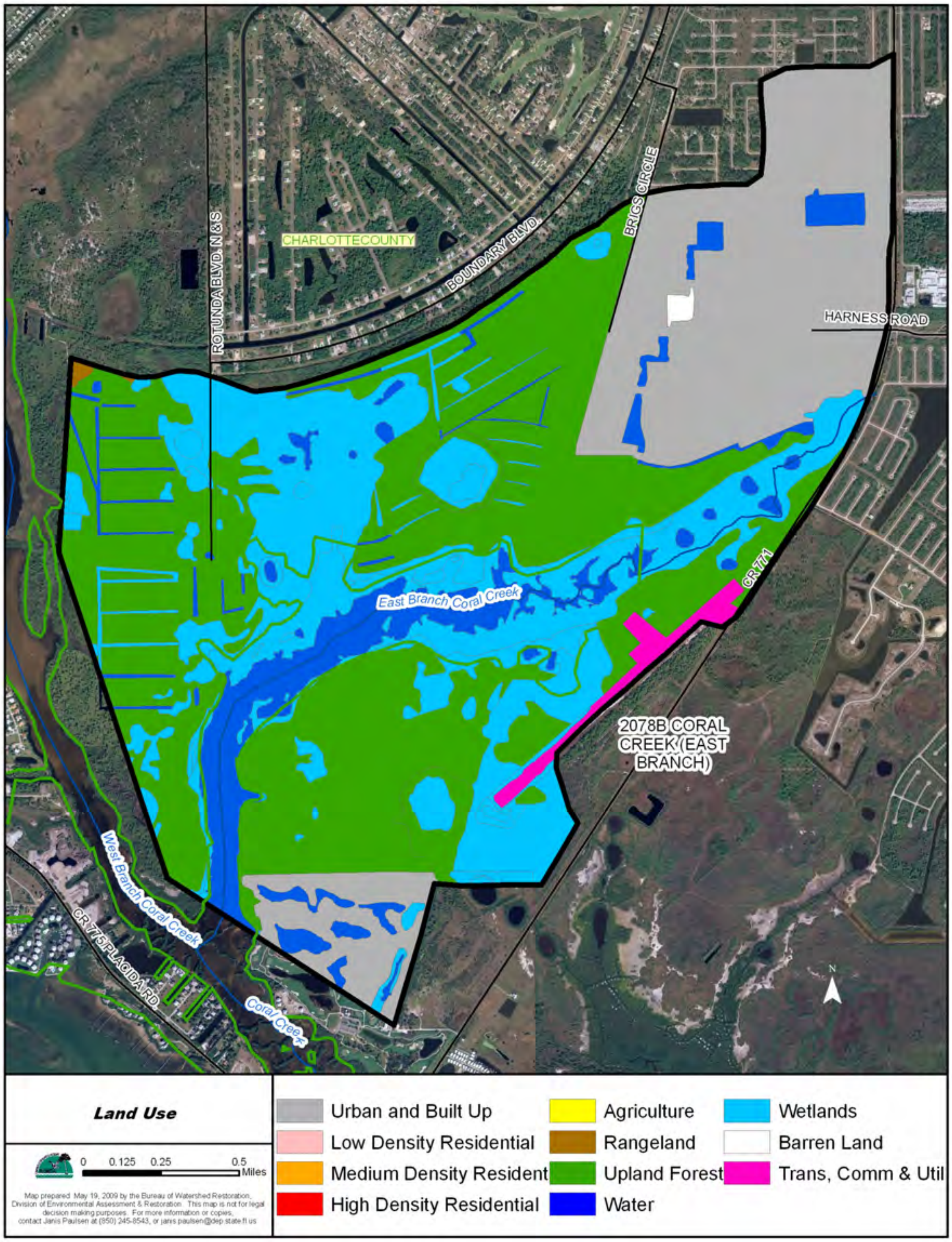
Ground water discharge as a potentially significant source of both water and chemicals to coastal areas is controversial in terms of the actual magnitude of ground water discharge on both local and regional scales. This controversy is fueled by differences in the magnitude of the flux in different locations and the difficulties in quantifying the freshwater and seawater components of ground water discharge. Ground water and surface water are unequivocally associated in this region. Due to the high solubility of nutrients in water, ground water is considered to be taken into account when samples are collected at water quality sampling stations throughout the waterbody.

Table 4.1. Classification of Land Use Categories in the Coral Creek–East Branch Watershed (WBID 2078B)

- = Empty cell/no data

Level 1 Code	Land Use	Acreage	% Acreage
1000	Urban and Built-Up	611.53	22.65%
2000	Agriculture	0.00	0.00%
3000	Rangeland	3.50	0.13%
4000	Upland Forest/Rural Open	1,091.47	40.42%
5000	Water	253.11	9.37%
6000	Wetlands	701.93	26.00%
7000	Barren Land	4.74	0.18%
8000	Transportation, Communication, and Utilities	33.74	1.25%
-	**TOTAL:**	**2,700.00**	**100.00%**

Figure 4.1. Principal Land Uses in the Little Coral Creek–East Branch Watershed (WBID 2078B) in 2006



Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

The goal of this TMDL analysis is to reduce the anthropogenic TN, TP, and BOD loads to Coral Creek–East Branch so as to improve DO concentrations. The methodology used for the TMDL was a percent reduction approach between the existing condition concentration and the water quality TMDL targets of 0.74 mg/L for TN, 0.044 mg/L for TP, and 2.0 mg/L for BOD.

5.1.1 Data Used in the Determination of the TMDL

The data used to develop this TMDL were mainly provided by the Department's South District Office (Stations: 21FLFTM SARABY0005FTM, 21FLFTM SARABY0006FTM, 21FLFTM SARABY0007FTM, and 21FLFTM SARABY0008FTM). **Figure 2.1** displays the locations of the water quality stations where DO, TN, TP, and BOD data were collected for Coral Creek–East Branch. The DO, TN, TP, and BOD data used in this analysis for Coral Creek–East Branch are available on request.

5.1.2 Spatial Patterns

There are 4 stations in Coral Creek–East Branch. An analysis of these 4 stations for DO (R^2 = 0.02), TN (R^2 = 0.01), TP (R^2 = 0.06), and BOD (R^2 = 0.02) indicated no spatial patterns (**Tables 5.1, 5.2, 5.3,** and **5.4**). Thus, instead of analyzing the DO, TN, TP, and BOD data by station, the data from each station were combined into a single dataset.

Table 5.1. Summary Statistics for DO Data by Station in Coral Creek–East Branch (WBID 2078B)

Station	N	Minimum (mg/L)	Maximum (mg/L)	Median (mg/L)	Mean (mg/L)
21FLFTM SARABY0005FTM	7	2.40	6.9	4.48	4.56
21FLFTM SARABY0006FTM	7	1.97	6.6	4.27	4.17
21FLFTM SARABY0007FTM	7	1.73	6.8	4.28	4.07
21FLFTM SARABY0008FTM	6	1.09	5.46	3.75	3.58

Table 5.2. Summary Statistics for TN Data by Station in Coral Creek–East Branch (WBID 2078B)

Station	N	Minimum (mg/L)	Maximum (mg/L)	Median (mg/L)	Mean (mg/L)
21FLFTM SARABY0005FTM	6	0.56	1.20	0.86	0.84
21FLFTM SARABY0006FTM	6	0.46	1.11	0.76	0.81
21FLFTM SARABY0007FTM	6	0.32	1.20	0.77	0.77
21FLFTM SARABY0008FTM	6	0.37	1.20	0.75	0.78

Table 5.3. Summary Statistics for TP Data by Station in Coral Creek–East Branch (WBID 2078B)

Station	N	Minimum (mg/L)	Maximum (mg/L)	Median (mg/L)	Mean (mg/L)
21FLFTM SARABY0005FTM	6	0.043	0.082	0.060	0.060
21FLFTM SARABY0006FTM	6	0.028	0.077	0.053	0.053
21FLFTM SARABY0007FTM	6	0.037	0.068	0.050	0.050
21FLFTM SARABY0008FTM	6	0.024	0.077	0.053	0.048

Table 5.4. Summary Statistics for BOD Data by Station in Coral Creek–East Branch (WBID 2078B)

Station	N	Minimum (mg/L)	Maximum (mg/L)	Median (mg/L)	Mean (mg/L)
21FLFTM SARABY0005FTM	6	1.5	3.1	2.25	2.27
21FLFTM SARABY0006FTM	6	1.3	3.9	2.70	2.57
21FLFTM SARABY0007FTM	6	1.5	3.4	2.25	2.30
21FLFTM SARABY0008FTM	6	1.2	3.2	2.45	2.35

5.1.3 TMDL Development Process

As described in **Section 5.1**, for the period from May 2007 to November 2007, the methodology used for this TMDL was a percent reduction approach between the existing condition concentration and the water quality TMDL targets of 0.74 mg/L for TN, 0.044 mg/L for TP, and 2.0 mg/L for BOD. For this method, in making the percent reduction more conservative, monthly means for TN, TP, and BOD were calculated for each month where 100 percent exceedances of the minimum DO criterion for Class III marine waterbodies, which is 4.0 mg/L, were observed. In July and September, 100 percent exceedances of the DO criterion were observed.

From the monthly means, a median TN, TP, and BOD value was calculated to generate the existing condition. The percent reduction needed to meet the applicable minimum DO criterion for Class III marine waterbodies of 4.0 mg/L was calculated from the existing condition concentration against the water quality TMDL targets of 0.74 mg/L for TN, 0.044 mg/L for TP, and 2.0 mg/L BOD (**Table 5.5**). The percent reduction is applied to the critical period (wet season: May–November). It is assumed that by reducing the TN, TP, and BOD concentrations to the targeted TMDL water quality concentrations during the critical period (wet season: May–November), the annual distribution (January–December) of DO concentration will also improve. Since this is a percent reduction and a concentration TMDL, it is assumed that monthly concentration and daily concentration are equal; therefore, a daily concentration was not calculated.

In Coral Creek–East Branch, the median percent reduction needed to reduce the anthropogenic TN, TP, and BOD loads so as to improve DO concentrations during the critical period (wet season: May–November) for the period from May 2007 to November 2007 was 31 percent for TN, 36 percent for TP, and 33 percent for BOD.

Table 5.5. TN, TP, and BOD Percent Reduction for Coral Creek–East Branch (WBID 2078B) for the Critical Period (Wet Season: May–November) during the Group 2, Cycle 2 Verified Period (January 1, 2001–June 30, 2008)

- = Empty cell/no data

Station	DO Result (mg/L)	TN Result (mg/L)	TN Water Quality TMDL Target (mg/L)	TN Exceed Monthly Mean (mg/L)	% Reduction	TP Result (mg/L)	TP Water Quality TMDL Target (mg/L)	TP Exceed Monthly Mean (mg/L)	% Reduction	BOD Result (mg/L)	BOD Water Quality TMDL Target (mg/L)	BOD Exceed Monthly Mean (mg/L)	% Reduction
21FLFTM SARABY0008FTM / Coral Creek, E Branch, N end, 1078 m above mouth~WB2078B-4	1.09	1.205	0.74	-	-	0.077	0.044	-	-	1.7	2	-	-
21FLFTM SARABY0007FTM / Coral Creek, East Branch, 725 meters above mouth~WB2078B-3	1.73	1.104	0.74	-	-	0.075	0.044	-	-	2	2	-	-
21FLFTM SARABY0006FTM / Coral Creek, East Branch, 290 meters above mouth~WB2078B-2	2.23	0.844	0.74	-	-	0.069	0.044	-	-	3.9	2	-	-
21FLFTM SARABY0005FTM / Coral Creek, E Branch, W of Golf Course near mouth~WB2078B-1	2.51	0.815	0.74	0.99	25%	0.068	0.044	0.0723	39%	3.1	2	3.00	33%
21FLFTM SARABY0008FTM / Coral Creek, E Branch, N end, 1078 m above mouth~WB2078B-4	2.63	1.208	0.74	-	-	0.069	0.044	-	-	3	2	-	-
21FLFTM SARABY0007FTM / Coral Creek, East Branch, 725 meters above mouth~WB2078B-3	2.57	1.209	0.74	-	-	0.056	0.044	-	-	2.9	2	-	-
21FLFTM SARABY0006FTM / Coral Creek, East Branch, 290 meters above mouth~WB2078B-2	1.97	1.208	0.74	-	-	0.058	0.044	-	-	3.1	2	-	-
21FLFTM SARABY0005FTM / Coral Creek, E Branch, W of Golf Course near mouth~WB2078B-1	2.4	1.11	0.74	1.18	37%	0.077	0.044	0.0650	32%	3	2	3.00	33%
-	**-**	**-**	**-**	**TN median:**	**31%**	**-**	**-**	**TP median:**	**36%**	**-**	**-**	**BOD median:**	**33%**

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. The goal of TMDL development for Coral Creek–East Branch is to identify the maximum allowable TN, TP, and BOD loadings to the estuarine stream so that it will meet applicable water quality standards and maintain its function and designated use as a Class III water.

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) that 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 BMPs.

This approach is consistent with federal regulation 40 CFR § 130.2[I] (EPA, 2003), which states that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or other appropriate measure. The TMDL for Coral Creek–East Branch is expressed in terms of pounds per year and percent reduction, and represents the maximum annual load the estuarine stream system can assimilate and maintain the narrative DO criterion (**Table 6.1**).

Table 6.1. TMDL Components for Fecal Coliform in Coral Creek–East Branch (WBID 2078B)

N/A = Not applicable

WBID	Parameter	TMDL (mg/L)	WLA for Wastewater (% reduction)	WLA for NPDES Stormwater (% reduction)	LA (% reduction)	MOS
2078B	TN	0.74	N/A	31%	31%	Implicit
2078B	TP	0.044	N/A	36%	36%	Implicit
2078B	BOD	2.0	N/A	33%	33%	Implicit

6.2 Load Allocation

The LAs for TN, TP, and BOD provided in **Table 6.1** represent the allowable nutrient and BOD loads that would result in DO improvement. 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 permitted NPDES wastewater discharges to surface water in the Coral Creek–East Branch watershed. As such, the WLA for wastewater discharges is not applicable.

6.3.2 NPDES Stormwater Discharges

Table 6.1 provides the NPDES stormwater percent reductions, which represent the allowable nutrient and BOD loads that would result in DO improvement. The stormwater collection systems in the Coral Creek–East Branch watershed are owned and operated by Charlotte County (#FLR04E043). It should be noted that any future 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

TMDLs must address uncertainty issues by incorporating an MOS into the analysis. The MOS is a required component of a TMDL and accounts for the uncertainty about the relationship between pollutant loads and the quality of the receiving waterbody (Clean Water Act, Section 303[d][1][c]). Considerable uncertainty is usually inherent in estimating nutrient loading from nonpoint sources, as well as in predicting water quality response. The effectiveness of management activities (e.g., stormwater management plans) in reducing loading is also subject to uncertainty. For the freshwater portion of Coral Creek–East Branch, an implicit MOS was employed.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the Department will determine the best course of action regarding its implementation. Depending on the pollutant(s) causing the waterbody impairment and the significance of the waterbody, the Department will select the best course of action leading to the development of a plan to restore the waterbody. Often this will be accomplished cooperatively with stakeholders by creating a Basin Management Action Plan, referred to as the BMAP. BMAPs are the primary mechanism through which TMDLs are implemented in Florida (see Subsection 403.067[7], F.S.). A single BMAP may provide the conceptual plan for the restoration of one or many impaired waterbodies.

If the Department determines that a BMAP is needed to support the implementation of this TMDL, a BMAP 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. 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 the following:

- *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 the obligations of wastewater point source, MS4, and non-MS4 stakeholders in TMDL implementation; enhanced transparency in the Department's decision making; and built strong relationships between the Department and local stakeholders that have benefited other program areas.

7.2 Other TMDL Implementation Tools

However, in some basins, and for some parameters, particularly those with fecal coliform impairments, the development of a BMAP using the process described above will not be the most efficient way to restore a waterbody, such that it meets its designated uses. This is because fecal coliform impairments result from the cumulative effects of a multitude of potential sources, both natural and anthropogenic. Addressing these problems requires good old-fashioned detective work that is best done by those in the area.

A multitude of assessment tools is available to assist local governments and interested stakeholders in this detective work. The tools range from the simple (such as Walk the WBIDs and GIS mapping) to the complex (such as bacteria source tracking). Department staff will provide technical assistance, guidance, and oversight of local efforts to identify and minimize fecal coliform sources of pollution. Based on work in the Lower St Johns River tributaries and the Hillsborough Basin, the Department and local stakeholders have developed a logical process and tools to serve as a foundation for this detective work. In the near future, the Department will be releasing these tools to assist local stakeholders with the development of local implementation plans to address fecal coliform impairments. In such cases, the Department will **rely on these local initiatives** as a more cost-effective and simplified approach to identify the actions needed to put in place a road map for restoration activities, while still meeting the requirements of Subsection 403.067(7), F.S.

References

CLimate Information for Management and Operational Decisions, 2008. The Southeast Regional Climate Center. University of North Carolina at Chapel Hill. http://www.sercc.net/

Florida Department of Environmental Protection. 1999. *Florida Watershed Restoration Act.* Chapter 99-223, Laws of Florida.

———. February 2001. *A report to the Governor and the Legislature on the allocation of total maximum daily loads in Florida.* Tallahassee, FL: Allocation Technical Advisory Committee, Division of Water Resource Management, Bureau of Watershed Management.

———. April 2001a. *Rule 62-303, F.A.C., Identification of Impaired Surface Waters Rule (IWR).* Tallahassee, FL: Division of Water Resource Management, Bureau of Watershed Management.

———. April 2001b. *Rule 62-302, F.A.C., Surface water quality standards*. Tallahassee, FL: Division of Water Resource Management, Bureau of Watershed Management.

———. 2002. *Basin status report: Charlotte Harbor.* Tallahassee, FL: Watershed Planning and Coordination Section. Available: http://www.dep.state.fl.us/water/basin411/charlotte/status.htm.

———. 2005. *Water quality assessment report: Charlotte Harbor.* Tallahassee, FL: Watershed Planning and Coordination Section. Available: http://www.dep.state.fl.us/water/basin411/charlotte/assessment.htm.

———. June 2006, 2008. Tallahassee, FL: Division of Environmental Assessment and Restoration, Bureau of Information Systems, Geographic Information Systems Section. Available: http://www.dep.state.fl.us/gis/contact.htm.

Harper, H.H., and E.H. Livingston. 1999. *Everything you always wanted to know about stormwater management but were afraid to ask.* Biennial Stormwater Research Conference, Tampa, FL.

Harper, H., and D. Baker. 2007. *Evaluation of current stormwater design criteria in Florida.* Prepared by Environmental Research and Design for the Florida Department of Environmental Protection. Available: http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/SW_TreatmentReportFinal_71907.pdf.

Price, C.B., C. Cerco, and D. Gunnison. 1994. *Sediment oxygen demand and its effects on dissolved oxygen concentrations and nutrient release: Initial laboratory studies.* U.S. Army Corps of Engineers: Water Quality Research Program. Technical Report W-94-1.

U.S. Census Bureau Website. 2008. Available: http://www.census.gov/.

U.S. Environmental Protection Agency. April 1991. *Guidance for water quality–based decisions: The TMDL process.* EPA-440/4-91-001. Washington, DC: Office of Water.

———. 2007. *Sediment oxygen demand studies.* Office of Environmental Measurement and Evaluation. Last updated on Monday, May 14, 2007. Available: http://www.epa.gov/.

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.

The rule 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, they have been established for Charlotte Harbor, 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 stormwater permitting program to designate certain stormwater discharges as "point sources" of pollution. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific standard industrial classification (SIC) codes, construction sites disturbing five or more acres of land, and the 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 has implemented Phase 1 of the MS4 permitting program on a countywide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the Florida Department of Transportation (FDOT) throughout the 15 counties meeting the population criteria.

An important difference between the federal and state stormwater permitting programs is that the federal program covers both new and existing discharges, while the state program focuses on new discharges. Additionally, Phase 2 of the NPDES Program will expand the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 10,000 people. The revised rules require that these additional activities obtain permits by 2003. 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. The Department recently accepted delegation from the EPA for the stormwater part of the NPDES Program. It should be noted that most MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs once they are formally adopted by rule.

Appendix B: TMDL Public Comments for Coral Creek – East Branch (WBID 2078B) from City of Northport (Elizabeth Wong)

August 10, 2009

Ms. Elizabeth Wong (Elaye), P.E.
Stormwater Manager
City of North Port
4970 City Hall Blvd
North Port, FL 34286

Re: Comments by Ms. Elizabeth Wong (City of North Port) on the DO TMDL for the East Branch-Coral Creek

Dear Ms. Wong:

Thank you for your insights and help in improving the quality of our TMDL for the East Branch-Coral Creek. We appreciate your offer to aid in future sampling efforts and look forward to working with you on the implementation phase of this TMDL. Please review our responses to your comments and let us know if you have any other questions.

1. Is it appropriate to set a TMDL limit on D.O. when samples were taken over a period, Feb 2006 to Dec 2007, which is the second year of consecutive severe drought years?

   Response: The Department is confident that the available data are adequate and that this TMDL will serve as the basis to begin the restoration process. TMDLs are often purposely looking to be protective of worst-case conditions. However, TMDLs are iterative, such that if over the next few years additional data become available to make a case to modify the TMDL, that can be done. In addition, we often point to the BMAP process as a way for specific allocations to be set, or to gather added data to refine areas where there may be uncertainty, either in our minds, in the minds of the stakeholders, or both.

2. Due to the shallow, warm waters of this East Coral Creek Branch, is the FDEP D.O. minimum criteria level of 4.0 mg/L appropriate?

   Response: The Department acknowledges that other watersheds in this part of Florida may not attain a DO value of 5.0 mg/L at all times, even in the absence of anthropogenic loads. However, in regards to the minimum DO criterion of 4.0 mg/L for Class III marine waterbodies, the water quality TMDL target of 4.0 mg/L for DO may seem low, but is attainable based on monthly median values of approximately 4.0 mg/L in May and November.

3. Even though the 4 sampling locations were set relatively close together, they were counted as separate sampling points. They appear to act as one sampling point. If this is the case, from Figure 2.1, only two (July and Sept) of the 6 events were below the 4.0 mg/L criteria. Will this still trigger a TMDL?

   Response: In the IWR, Paragraphs 62-303.320(4)(b) and (c) state the following: (b) Samples collected within 200 meters of each other will be considered the same station or location, unless there is a tributary, an outfall, or significant change in the hydrography of the water; and (c) samples collected from different stations within a water segment shall be assessed as separate samples even if collected at the same time.

   The stations are located greater than 200 meters apart from each other; therefore, they are considered 4 different sampling stations. Again, additional stations can be established and new data gathered to help better characterize the waterbody. If a different understanding is achieved, the TMDL can be modified.

4. The Charlotte County staff was not given prior notification that TMDL sampling was occurring, or contacted for input on the sampling locations. If they were contacted, input could have been provided of the possibility of an overflow (or lack of an overflow in a drought year) from the Rotunda Canals and a sample/flow monitoring point at that location would have been appropriate.

   Response: The Department's South District contacted the Englewood Water District, Sarasota County, Charlotte County Utilities, Charlotte County Health Department, and city of Sanibel for assistance in determining water quality sampling locations in the Charlotte Harbor Basin.

5. The study linked the low D.O. to higher concentrations of total nitrogen and total phosphorus concentrations. Stream flow was not monitored and loading was not computed. Due to the drought conditions with expected low freshwater flows, wouldn't it be possible that the total nitrogen and phosphorus <u>loading</u> be small in comparison to the total loading from other tributaries to Charlotte Harbor? Shouldn't efforts be focused on tributaries with high <u>load</u> contributions to get the best "bang for the buck" in these times of limited resources?

   Response: According to local stakeholders, stream flow was not monitored in Coral Creek–East Branch because it is tidally influenced. Since stream flow did not exist and the Department did not have available time to model Coral Creek–East Branch given the time frame for TMDL development, loadings could not be calculated for the watershed.

   Section 303(d) of the federal Clean Water Act requires states to submit to the EPA lists of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant causing the 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], F.S.); the state's 303(d) list is amended annually to include basin updates.

   Florida's 1998 303(d) list included Coral Creek–East Branch (WBID 2078B) in the Charlotte Harbor 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, F.A.C. (IWR), in April 2001; the rule was modified in 2006 and 2007.

   The Department used the IWR to assess water quality impairments and has verified the impairments for low DO in Coral Creek–East Branch. WBIDs were verified as impaired for DO based on data that indicated an exceedance rate greater than or equal to 10 percent, with a 90 percent confidence level. The Class III marine water quality criterion is that DO shall not average less than 5.0 mg/L in a 24-hour period and shall never be less than 4.0 mg/L. Normal daily and seasonal fluctuations above these levels shall be maintained. As part of the listing process, the Department attempts to identify the limiting nutrient or nutrients for the impaired waterbody. The limiting nutrient, generally nitrogen or phosphorus, is defined as the nutrient that limits plant growth when it is not available in sufficient quantities.

   The projected year for the TMDLs in the Charlotte Harbor Basin to be developed 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 the EPA by September 30, 2009.

6. For future FDEP TMDL sampling, I will strongly suggest that in the spirit of cooperation, that FDEP gives the regulated municipality, a courtesy notification **prior** to TMDL sampling as local staff has a lot more knowledge of the drainage basins and possible pollutant contributions than FDEP staff, and can provide meaningful input on the sampling program.

   Response: In addition to being part of our list of interested parties, your contact information has been provided to the Watershed Assessment Section, which is the group within the Department that will coordinate with you on future sampling needs in your area.

We thank you for your interest in water quality issues in your area and look forward to working with you on implementing this and future TMDLs.

Sincerely,

Jan Mandrup-Poulsen, Environmental Administrator
Watershed Evaluation and TMDL Section

ec: Jennifer Nelson
Jennifer Thera

Appendix C: TMDL Public Comments for Coral Creek–East Branch (WBID 2078B) from Tom Moore

August 7, 2009

Mr. Tom Moore
Citizen / Water Monitor
Charlotte Harbor Estuary
Volunteer Water Quality Monitoring Network

Dear Mr. Moore:

The Watershed Evaluation and TMDL Section really appreciate your comments regarding the Coral Creek – East Branch Dissolved Oxygen (DO) TMDL. The large turn-out of stakeholders was evidence of everyone's interest and concern for impaired waters located in the Charlotte Harbor Basin.
In regards to your comments pertaining to the TMDL document, we have revised the document accordingly:

1. The report states the area to be Hillsborough County, not Charlotte County.
Action taken: The TMDL document now reads "Charlotte County."
2. The water district is shown as South Florida Water Management District, not Southwest Florida Water Management District.
Action taken: The TMDL document now reads "Southwest Florida Water Management District."
3. There is a reference about a golf course that is actually located downstream of the four testing stations; and therefore, an unlikely cause of contaminants.
Action taken: The TMDL document includes the following text:

Land Uses

The spatial distribution and acreage of different land use categories were identified using the Florida Land Use, Cover, and Forms Classification System (FLUCCS) and the South Florida Water Management District (SFWMD) 2006 land use coverage contained in the Department's GIS library. Land use categories in the Coral Creek–East Branch (WBID 2078B) watershed were aggregated using the simplified Level 1 codes tabulated in **Table 4.1**. The Coral Creek–East Branch watershed encompasses 2,700 acres. The predominant land uses are approximately 1,091 acres of upland forest/rural open, 701 acres of wetlands, and 611 acres of urban and built-up. Specifically, medium-density residential is located in the north, northeast, and southwest portions of the WBID. A golf course is located on the southwest side at the mouth of Coral Creek–East Branch, and a low-use airstrip is located to the east (**Figure 4.1**). Coral Creek–East Branch is tidally influenced and during high-tide events portions may be influenced by nutrients (TN and TP) located in the downstream portion of the watershed. However, the potential nutrient effects are unknown and need further investigation.

Thank you for your assistance in improving the quality of our TMDL report!

Sincerely,

Jan Mandrup-Poulsen, Administrator
Watershed Evaluation and TMDL Section

Appendix D: TMDL Public Comments for Coral Creek–East Branch (WBID 2078B) from FDOT

August 18, 2009

Mr. Joshua Boan
Environmental Process/Natural Sciences Manager
Environmental Research Administrator
605 Suwannee Street, MS 37
Tallahassee, FL 32399

Re: FDOT Comments on Newly Released Draft TMDLs

Dear Mr. Boan:

The Department appreciates the time and effort you and your staff put into reviewing these draft TMDLs. We have made necessary edits to some draft TMDL reports as a result of your comments. Because of your efforts, these final TMDLs will be improved. To aid you in reviewing our responses, we have included your comments, followed by a response to each (in blue), in the order in which they were presented.

Please contact me at Jan.Mandrup-Poulsen@dep.state.fl.us, if you have any further questions.

Sincerely,

Jan Mandrup-Poulsen, Administrator
Watershed Evaluation and TMDL Section
Florida Department of Environmental Protection

ec: Marjorie Bixby/FDOT
John Abendroth

CHARLOTTE HARBOR
Coral Creek (WBID 2078B): DO/Nutrients

1. Figure 1.2 identifies some FDOT local roads in the WBID but these are not actually FDOT roads. There are presently no FDOT roads in or adjacent to the WBID.

   Response: The legend of **Figure 1.2** has been changed. The legend reads Local Roads instead of FDOT Local Roads.

Florida Department of Environmental Protection
Division of Environmental Assessment and Restoration
Bureau of Watershed Restoration
2600 Blair Stone Road, Mail Station 3565
Tallahassee, Florida 32399-2400