FINAL

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTH DISTRICT • EVERGLADES WEST COAST BASIN

TMDL Report

Fecal Coliform TMDL for the Cocohatchee River Estuary, WBID 3259A

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Websites

Florida Department of Environmental Protection, Bureau of Watershed Management

TMDL Program

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

Identification of Impaired Surface Waters Rule

https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-303

STORET Program

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

2006 305(b) Report

http://www.dep.state.fl.us/water/tmdl/docs/2006_Integrated_Report.pdf

Criteria for Surface Water Quality Classifications

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

Basin Status Report for the Everglades West Coast Basin

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

Water Quality Assessment Report for the Everglades West Coast Basin

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

U.S. Environmental Protection Agency, National STORET Program

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 fecal coliform in the Cocohatchee River Estuary, located in the northwest section of the Everglades West Coast Basin. The estuary was verified as impaired for fecal coliform based on the results of sampling and analysis carried out between January 1, 1995, and June 30, 2007. These results revealed that 70 percent of the fecal coliform values measured during the planning period and 57 percent of the fecal coliform values measured during the verified period were above the Class II fecal coliform criterion of 43 counts/100 milliliters (counts/mL). During the verified period, 178 surface water samples were analyzed for fecal coliform, with a median value of 59 counts/100mL.

The Cocohatchee River Estuary was subsequently included on the Verified List of impaired waters (impaired for fecal coliform) that was adopted by Secretarial Order in June 3, 2008. The TMDL establishes the allowable loadings that would restore the Cocohatchee River Estuary so that it meets its applicable water quality criterion for fecal coliform.

1.2 Identification of Waterbody

The Cocohatchee River Estuary watershed is located in Collier County in south Florida, encompassing the cities of Bonita Springs, Naples Park and Palm River (**Figure 1.1**). It is one of 80 waterbody segments in the Everglades West Coast Basin Group of WBIDs and one of 49 segments in the Southwest Coast Planning Unit (the Everglades West Coast Basin has three Planning Units, the other two are Estero Bay and the Interdrainage Area).

The drainage area of the Cocohatchee River Estuary is 4.82 square miles (mi^2) (or 3,087.4 acres), and it makes up 0.42 percent of the Southwest Coast Planning Unit (**Table 1.1** and **Figure 1.2**). The watershed is bounded by Bonita Beach Road Southwest (SW) to the north, Vanderbilt Beach Road to the south, Barefoot Beach Preserve and Delnor-Wiggins State Recreation Area to the west, and the South Florida Water Management District (SFWMD) control structure COCO1 to the east. The Cocohatchee River Estuary is the primary receiving waterbody for the Cocohatchee River proper, which flows predominantly west over the spillway gate structure COCO1 and is 8.5 miles long, originating in the Cocohatchee Inland waterbody segment (**Figure 1.1**).

Additional information about the river's hydrology and geology are available in the Basin Assessment Report for the Everglades West Coast Basin (Florida Department of Environmental Protection [Department], 2003). For assessment purposes, the Department has divided the Everglades West Coast Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. The Cocohatchee River Estuary is WBID 3259A (**Figure 1.1**).

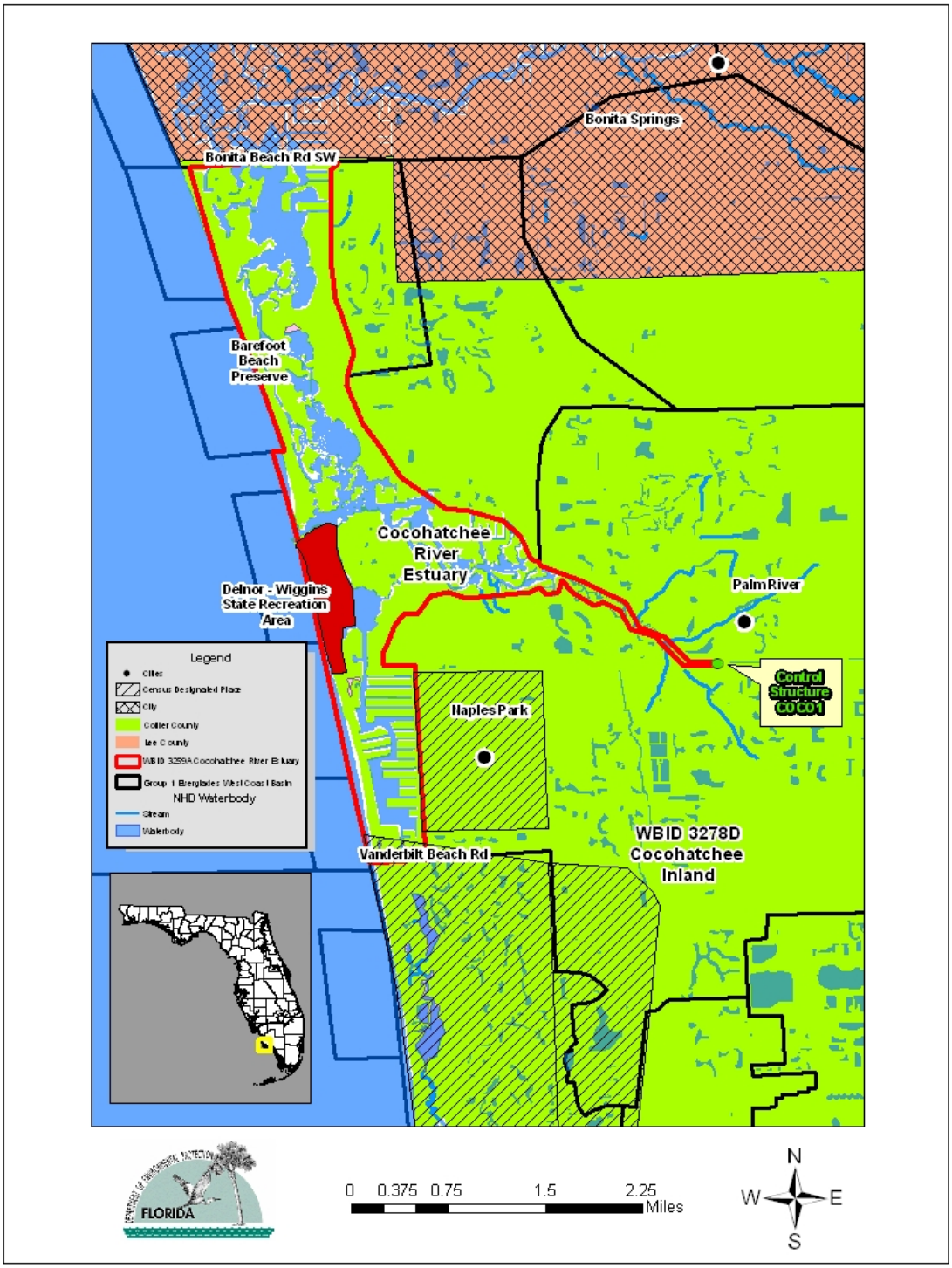


Figure 1.1. Cocohatchee River Estuary Watershed with Geopolitical Features in Region

Table 1.1. WBIDs in the Southwest Coast Planning Unit, Including Verified Impairments

WBID Number	WBID Name	Area (acres)	Impairments
3259A	Cocohatchee River Estuary	3,087.4	Fecal Coliform, Iron
3259B	Drainage to Corkscrew	21,281.1	N/A
3259I	Camp Keais	55,708.4	N/A
3259M	Ten Thousand Islands	133,056.7	N/A
3259W	Lake Trafford	1,489.9	Dissolved Oxygen (DO), Trophic State Index (TSI), pH, Unionized Ammonia
3259Z	Little Hickory Bay	6,34.5	N/A
3278C	Cocohatchee Golf Course Discharge	2,154.5	N/A
3278D	Cocohatchee Inland	25,836.3	DO, Copper
3278E	Cow Slough	20,920.3	N/A
3278F	Corkscrew Marsh	52,914.7	DO
3278G	Fakahatchee Strand	94,500	DO, Fecal Coliform
3278H	Faka Union North	27,449.6	N/A
3278I	Faka Union South	59,451.7	N/A
3278K (formerly 3259C)	Gordon River Extension	5,153.7	DO
3278L	Immokalee Basin	8,745	DO
3278O	Marco Island	8,473.5	N/A
3278P	Marco Island South	10,815.1	N/A
3278Q	Naples	5,026.7	N/A
3278R (formerly 3259G)	Naples Bay Coastal	9,580.8	DO, Fecal Coliform, Copper, Iron
3278S (formerly 3259D + 3259E)	North Golden Gate	72,773.3	DO, Iron
3278U	Rookery Bay Coastal	38,632.3	Fecal Coliform
3278V	Rookery Bay Inland East	53,991.5	N/A
3278Y	Rookery Bay Inland West	15,054.6	N/A
	TOTAL:	**726,097.10**	

NA – Not applicable.
Note – The WBIDs listed above do not include the 8000 series of coastal WBIDs.

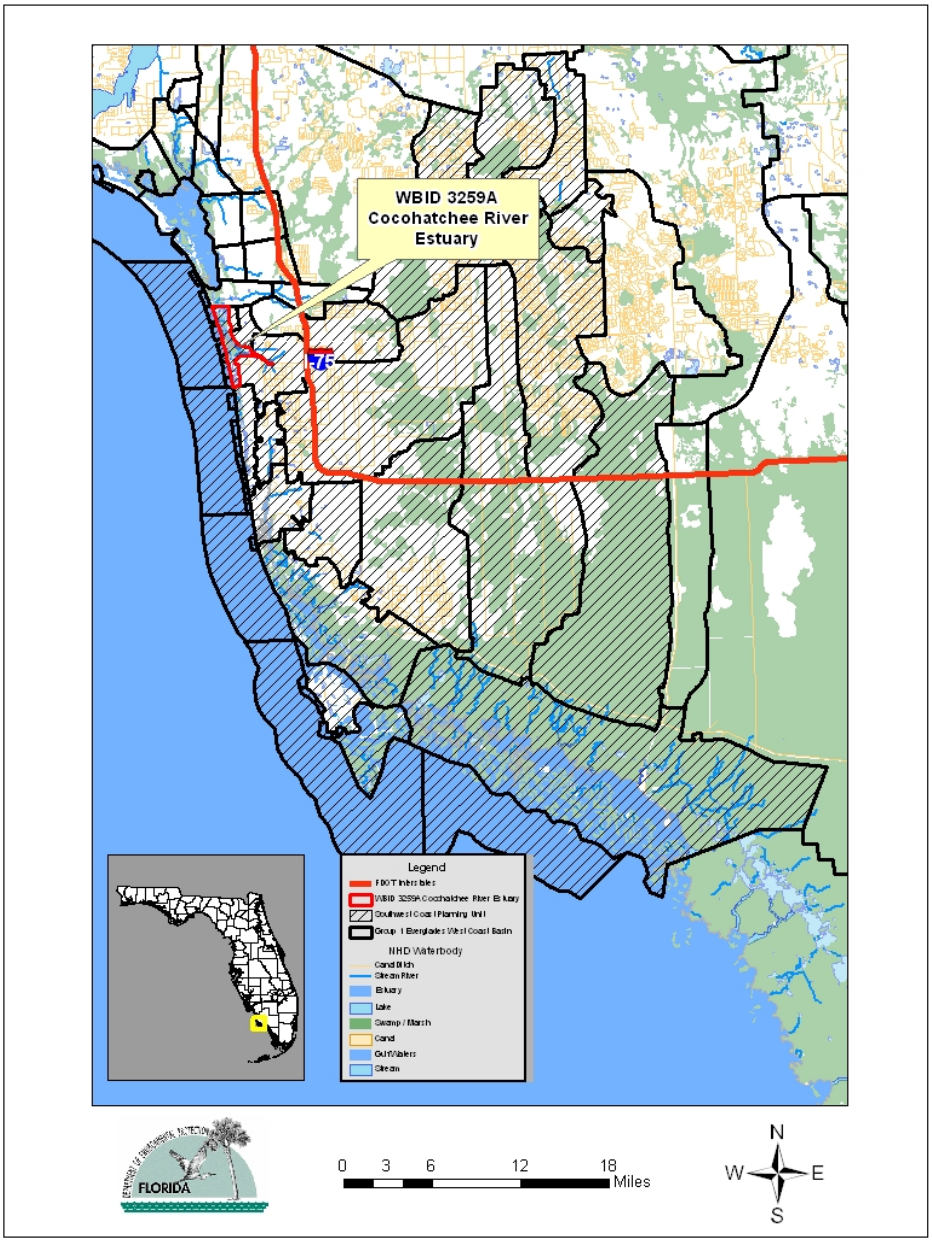


Figure 1.2. Cocohatchee River Estuary Watershed in the Southwest Coast Planning Unit

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, or BMAP, to decrease the fecal coliform impairment in the Cocohatchee River Estuary (WBID 3259A). These activities will depend heavily on the active participation of the Collier County Pollution Control (Collier County), Florida Department of Agriculture and Consumer Services (FDACS), SFWMD, local governments, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake and continue reductions in the discharge of pollutants and achieve the established TMDLs for this waterbody.

1.3.1 Development of TMDL

This TMDL was developed in cooperation with Collier County, the SFWMD, the Department's South District, FDACS' Division of Aquaculture, and several other entities. There was also active coordination with a variety of local stakeholders throughout the TMDL development process. This included technical meetings and teleconferences between Department staff, Collier County representatives, environmental advocacy groups, consultants, and other stakeholders who volunteered to participate.

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) a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant source in each of these impaired waters on a schedule. The Department has developed these lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin is also required by the FWRA (Subsection 403.067[4], Florida Statutes [F.S.]), and the list is amended annually to include updates for each basin statewide.

Florida's 1998 303(d) list included 13 waterbodies in the Everglades West Coast 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 amended in 2006 and 2007. The list of waters for which impairments have been verified using the methodology in the IWR is referred to as the Verified List.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the Cocohatchee River Estuary and verified the estuary as impaired for fecal coliform based on data in the Department's IWR database. The projected year for the TMDL was 2007, 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, this TMDL must be adopted and submitted to the EPA, Region 4, by September 30, 2008.

Figure 2.1 displays the locations of the sample stations in the Cocohatchee River (WBID 3259A) with the SFWMD control structure COCO1 on the east side of the WBID. **Figure 2.2** displays the fecal coliform sample concentrations over time.

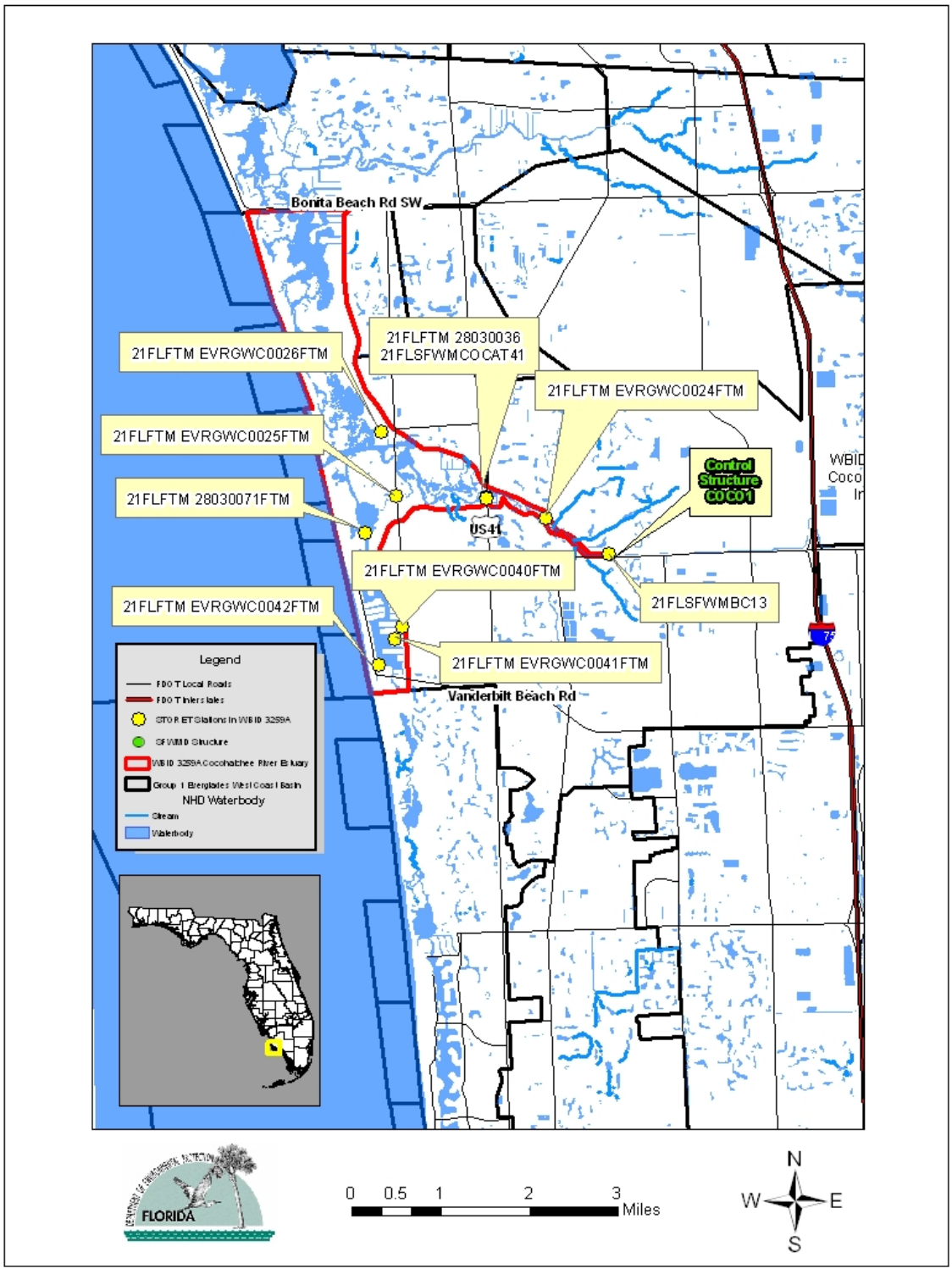


Figure 2.1. Sample Stations in the Cocohatchee River Estuary, WBID 3259A

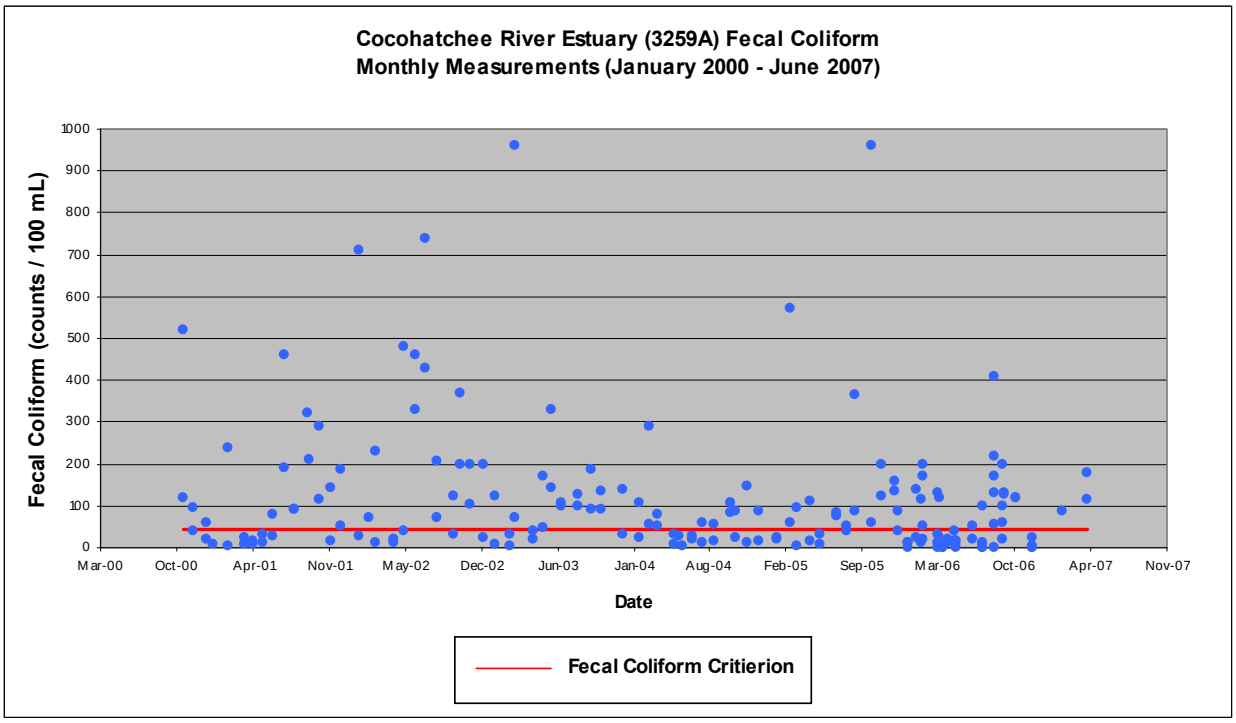


Figure 2.2. Fecal Coliform Measurements for the Cocohatchee River Estuary, WBID 3259A (January 1, 2000–June 30, 2007)

Chapter 3. WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criterion 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)**

The Cocohatchee River Estuary is a Class II marine waterbody, with a designated use of shellfish propagation or harvesting. The criterion applicable to this TMDL is the Class II criterion for fecal coliform.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

3.2.1 Fecal Coliform Criterion

Numeric criteria for bacterial quality are expressed in terms of fecal coliform bacteria concentrations. The water quality criterion for the protection of Class II waters, as established by Rule 62-302, F.A.C., states the following:

> ***Fecal Coliform Bacteria:***
>
> *The Most Probable Number (MPN) shall not exceed a median value of 14 with not more than 10% of the samples exceeding 43, nor exceed 800 on any one day.*

The criterion states that monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. However, there were insufficient data (fewer than 10 samples in a given month) available to evaluate the geometric mean criterion for fecal coliform bacteria. Therefore, the criterion selected for the TMDL was not to exceed 43 counts/100mL.

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 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, 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 Fecal Coliform in the Cocohatchee River Estuary Watershed

4.2.1 Point Sources

Wastewater Point Sources

There are no NPDES wastewater facilities authorized to discharge into the Cocohatchee River. However, several wastewater facilities within the WBIDs surrounding the Cocohatchee River Estuary watershed have NPDES discharge permits (**Figure 4.1**).

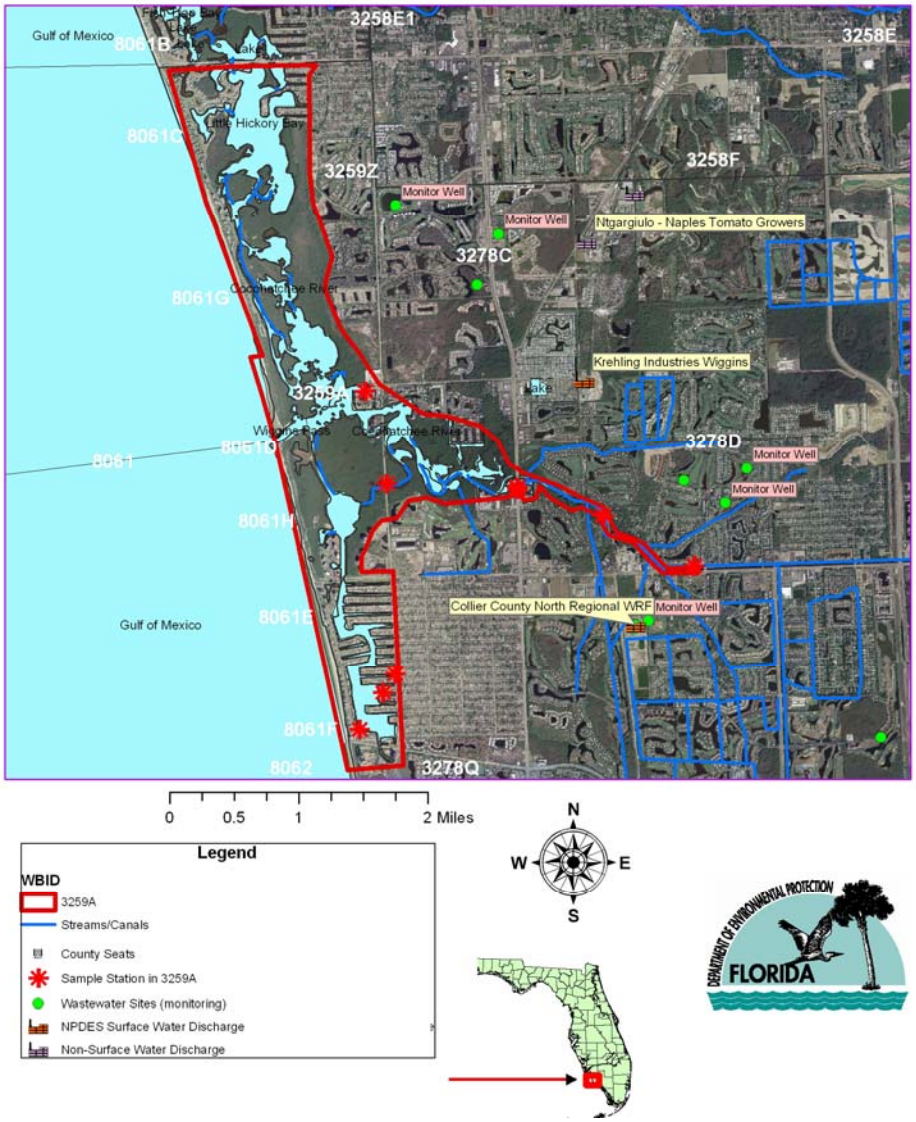


Figure 4.1. Locations of Permitted Facilities in the Cocohatchee River Estuary Watershed

Municipal Separate Storm Sewer System Permittees

The Cocohatchee River Estuary watershed is covered by the Collier County Phase II municipal separate storm sewer system (MS4) permit (FLR04E037).

4.2.2 Land Uses and Nonpoint Sources

Additional coliform loadings to the Cocohatchee River Estuary are generated from nonpoint sources in the watershed. Potential nonpoint sources of coliform include loadings from surface runoff, wildlife, pets, leaking or overflowing sewage lines, and leaking septic tanks.

Land Uses

The spatial distribution and acreage of different land use categories were identified using the 1999 land use coverage provided by the SFWMD. Land use categories and acreages in the watershed were aggregated using the Level 1 and Level 2 codes tabulated in **Tables 4.1** and **4.2**. The Cocohatchee River Estuary watershed is a small, predominantly undeveloped area. As shown in **Table 4.1**, over 70 percent is either wetland or water, but the next largest category is urban and built-up (22 percent, or 690 acres). Almost 75 percent of the urban and built-up acreage is either medium-density residential (334 acres) or high-density residential (167 acres).

Population

The U.S. Census Bureau estimates that in 2006, the population of Collier County was 314,649. Based on the land use map and Census estimates, between 3,000 and 4,000 persons reside in the Cocohatchee River Estuary watershed, mostly in the southeast area known as Vanderbilt Beach Estates, which is composed of medium- and high-density residential (**Figure 4.2**).

Table 4.1. Level 1 Land Use in the Cocohatchee River Estuary Watershed

Level 1 Land Use Code and Description	Acres	% Total
1000: Urban and Built-up	690.3	22.36%
3000: Rangeland	81.6	2.64%
4000: Upland Forests	54.8	1.78%
5000: Water	980.7	31.76%
6000: Wetland	1,259.8	40.80%
7000: Barren Land	13.9	0.45%
8000: Transportation, Communication, and Utilities	6.4	0.21%
Total:	**3,087.4**	**100.00%**

Table 4.2. Level 2 Land Use in the Cocohatchee River Estuary Watershed

Level 2 Land Use Code and Description	Acres	% Total
1200: Residential, Medium Density	334.2	10.82%
1300: Residential, High Density	167.4	5.42%
1400: Commercial	97.4	3.15%
1800: Recreation	91.4	2.96%
3200: Shrub and Brushland	81.6	2.64%
4100: Upland Coniferous	13.6	0.44%
4200: Upland Hardwood	37.2	1.21%
4300: Upland Mixed Forest	3.9	0.13%
5100: Streams and Waterways	353.4	11.45%
5200: Lakes	14	0.45%
5300: Reservoirs	1.4	0.04%
5400: Bays and Estuaries	525.2	17.01%
5700: Wetland	86.7	2.81%
6100: Wetland Hardwood Forests	1,023.8	33.16%
6200: Wetland Coniferous Forests	5.9	0.19%
6300: Wetland Forest Mixed	40.4	1.31%
6400: Vegetated Nonforested Wetlands	182.6	5.91%
6500: Nonvegetated Wetlands	7.1	0.23%
7400: Disturbed Land	13.9	0.45%
8100: Transportation	6.4	0.21%
Total:	**3,087.4**	**100.00%**

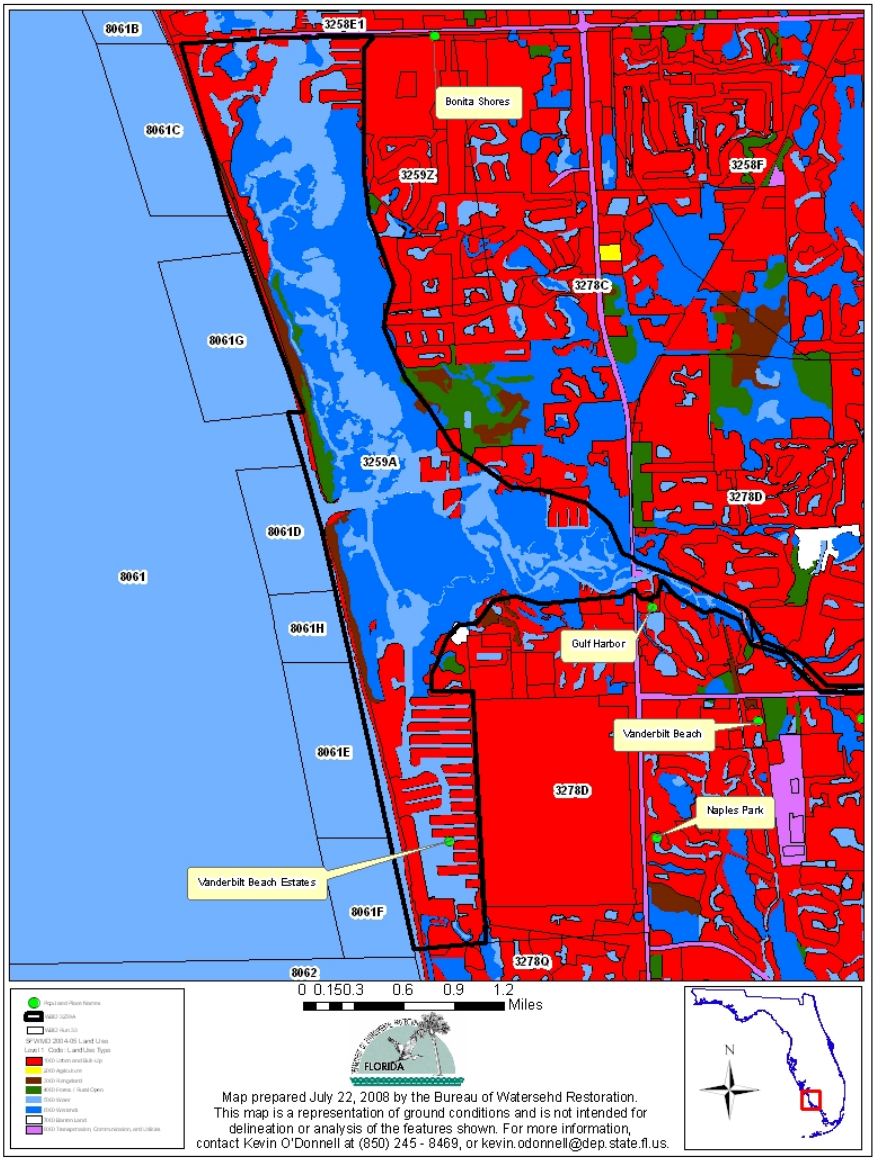


Figure 4.2. Residential Areas and Land Uses in the Cocohatchee River Estuary Watershed

Septic Tanks

The Cocohatchee River Estuary watershed and surrounding areas are serviced by the Collier County North Regional Water Reclamation Facility (WRF). In 1996, 31,360 people received service from this facility.

Between 1970 and 2007, 43,000 septic systems were installed in Collier County. For fiscal years 1992 through 2007, the average annual number of repair permits in Collier County was 257. Fiscal years 2001 through 2002 had the fewest repair permits, with 80; and 2006 through 2007 had the most, with 426. Although the exact percentage of households with septic tank systems or the number of repair permits that were actually for homes in the Cocohatchee River Estuary watershed is not available, an estimate is provided below.

Based on the U.S. Census Bureau estimate, the average household size in Collier County is 2.39 persons; the county has an approximate population of 314,649 and 131,652 households. The estimated number of septic tank repair permits in the county is 257, with 0.20 percent of households requiring repair permits annually. There are approximately 3,500 persons in WBID 3259A and about 1,500 households. Therefore, 0.20 percent of 1,500 households results in 3 repair permits, which are assumed to be 3 failed septic tanks. **Table 4.3** provides the estimated loads resulting from failed septic tanks.

Table 4.3. Estimation of Daily Fecal Coliform Load from Failed Septic Tanks in the Cocohatchee River Estuary Watershed

Estimated Number of Households in WBID 3259A	Estimated Number of Tank Failures	Estimated Load from Failed Tanks	Gallons per Person per day	Estimated Number of Persons per Household	Estimated Load from Failing Tanks
1,500	3	10,000 fecal colonies per mL	70	2.39	1.90E+10

Agriculture

Agriculture is not listed as a land use category in WBID 3259A; thus based on this information, there are no livestock in the watershed contributing to the fecal coliform load.

Pets

Tables 4.4 and **4.5** provide an estimate of the fecal coliform loads from dogs and cats in the watershed.

Table 4.4. Estimated Loading from Dogs in the Cocohatchee River Estuary Watershed

Estimated Number of Households in WBID 3259A	Estimated Households Owning Dogs*	Estimated No. of Dogs per Dog-owning Households	Total No. of Dogs Owned	Fecal Load in CFU per Day per Dog	Estimated Load from Dogs
1,500	487.5	1.6	780	4.09E+09	3.19E+12

* Based on a 32.5% ownership rate for Florida (American Veterinary Medical Association (AVMA) *Pet Ownership Sourcebook*.
CFU – Colony-forming units.

Table 4.5. Estimated Loading from Cats in the Cocohatchee River Estuary Watershed

Estimated Number of Households in WBID 3259A	Estimated Households Owning Cats*	Estimated No. of Cats per Cat-owning Household	Total No of Cats Owned	Fecal Load in CFU per Day per Cat	Estimated Load from Cats
1,500	438	2	876	5.04E+02	4.42E+5

* Based on a 29.2% ownership rate for Florida (AVMA *Pet Ownership Sourcebook*).

4.2.3 Source Summary

It is important to note that the sources listed here are not a complete list and that more information and monitoring are necessary and recommended to permit a more detailed understanding of the relative contributions from various sources. Sources not quantified here because of a lack of information include contributions from wildlife, sewer line leaks, and septic systems that are operational and continue to be used but may contribute to the fecal coliform load.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

Typically, continuous flow measurements in a watershed can be used to develop a bacteria TMDL. However, as tides influence the majority of the Cocohatchee River Estuary where fecal coliform data were collected, this fecal coliform TMDL was developed using the "percent reduction" approach. For this method, the percent reduction needed to meet the state fecal coliform standard of 43 counts/100mL is calculated for each value above the criterion, and then a median percent reduction is calculated.

5.1.1 Data Used in the Determination of the TMDL

The data used to develop this TMDL were collected by the Collier County Pollution Control and Prevention Department at Stations 21FLSFWMBC13 and 21FLSFWMCOCAT41. The Department's South District also collected data at Stations 21FLFTM 28030036, 21FLFTM EVRGWC0024FTM, 21FLFTM EVRGWC0025FTM, 21FLFTM EVRGWC0026FTM, 21FLFTM EVRGWC0040FTM, 21FLFTM EVRGWC0041FTM, and 21FLFTM EVRGWC0042FTM. **Figure 5.1** shows the locations of the sample sites where fecal coliform data were collected. **Figure 2.1** displays the fecal coliform data used in this analysis, which includes all verified period data (January 1, 2000, through June 30, 2007). The stations with the most fecal coliform samples are 21FLSFWMBC13 and 21FLSFWMCOCAT41, with 167 and 143 samples, respectively.

Table 5.1 shows the data used to determine the percent reduction for fecal coliform for each sampling station. **Table 5.2** summarizes the data by month and season. February, August, September, and October have the highest number of exceedances, with 11, 14, 14, and 13 exceedances, respectively. Typically, most exceedances occur during the summer months due to higher amounts of rainfall, but the data show that exceedances occur chronically throughout the different seasons.

Table 5.3 provides summary information for station data by year. For data collected during the verified period (2000–07), the number of fecal coliform exceedances is consistent, with a slight increase in 2006. The trend over the years does not show that the maximum exceedance value increases, but rather varies throughout each year.

Figure 5.2 shows the fecal coliform percent exceedance and rainfall by month and season. **Figure 5.3** shows the fecal coliform averages by station from upstream (Station 21FLSFWMDBC13) to downstream (Station 21FLFTM EVRGW0042FTM). The fecal coliform trend by station location shows that exceedances overall decrease from upstream to downstream, but that the most exceedances occurred at Station 21FLSFWMCOCAT41.

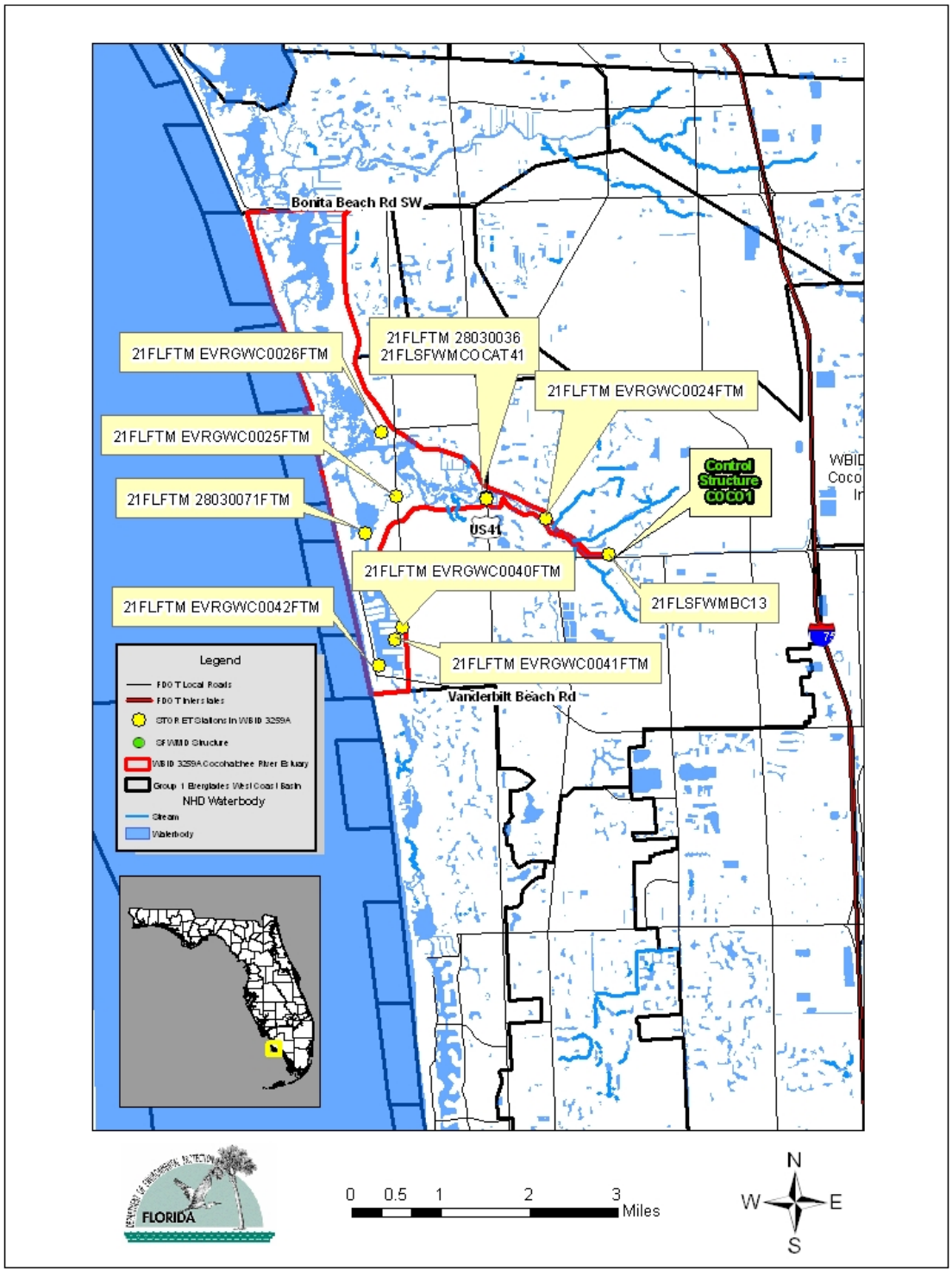


Figure 5.1. Map of Historical Monitoring Sites in the Cocohatchee River Estuary, WBID 3259A

Table 5.1. Calculation of Percent Reduction in Fecal Coliform Necessary To Meet the Water Quality Standard of 43 Colonies/100mL in the Cocohatchee River Estuary, WBID 3259A

Date/Time	Station	Fecal Coliform Exceedance	Fecal Coliform Target	% Reduction
5/21/2003 11:10	21FLSFWMBC13	46	43	7
3/16/2004 12:00	21FLSFWMCOCAT41	50	43	14
2/13/2006	21FLFTM EVRGWC0026FTM	50	43	14
7/27/2005 13:52	21FLSFWMCOCAT41	52	43	17
6/20/2006 14:02	21FLSFWMCOCAT41	52	43	17
12/6/2001 11:37	21FLSFWMBC13	53	43	19
2/26/2004 10:55	21FLSFWMBC13	54	43	20
8/10/2004 10:55	21FLSFWMCOCAT41	56	43	23
8/17/2006 11:24	21FLSFWMBC13	56	43	23
12/18/2000 11:39	21FLSFWMCOCAT41	58	43	26
7/12/2004 11:15	21FLSFWMCOCAT41	58	43	26
2/28/2005 11:52	21FLSFWMBC13	58	43	26
9/11/2006	21FLFTM EVRGWC0026FTM	60	43	28
9/29/2005 12:50	21FLSFWMCOCAT41	61	43	30
2/19/2002 12:35	21FLSFWMCOCAT41	70	43	39
8/14/2002 10:40	21FLSFWMBC13	70	43	39
3/10/2003 11:40	21FLSFWMCOCAT41	73	43	41
6/29/2005 12:17	21FLSFWMBC13	76	43	43
6/12/2001 11:17	21FLSFWMBC13	78	43	45
3/16/2004 11:07	21FLSFWMBC13	81	43	47
6/29/2005 13:24	21FLSFWMCOCAT41	83	43	48
9/23/2004 10:42	21FLSFWMBC13	84	43	49
10/6/2004 12:04	21FLSFWMCOCAT41	86	43	50
12/7/2004 13:03	21FLSFWMCOCAT41	88	43	51
8/15/2005 12:25	21FLSFWMBC13	88	43	51
2/13/2007 13:08	21FLSFWMBC13	88	43	51
12/7/2005 13:26	21FLSFWMCOCAT41	89	43	52
8/7/2001 10:55	21FLSFWMBC13	90	43	52
8/7/2001 11:43	21FLSFWMCOCAT41	90	43	52
9/23/2003 12:40	21FLSFWMBC13	90	43	52
10/20/2003 11:10	21FLSFWMBC13	90	43	52
11/15/2000 13:10	21FLSFWMCOCAT41	96	43	55
3/16/2005 9:55	21FLSFWMCOCAT41	96	43	55
7/9/2003 11:31	21FLSFWMBC13	98	43	56
8/19/2003 12:20	21FLSFWMBC13	99	43	57
7/18/2006 13:13	21FLSFWMCOCAT41	100	43	57
9/11/2006	21FLFTM EVRGWC0025FTM	100	43	57

Date/Time	Station	Fecal Coliform Exceedance	Fecal Coliform Target	% Reduction
11/12/2002 10:50	21FLSFWMBC13	104	43	59
7/9/2003 12:04	21FLSFWMCOCAT41	106	43	59
9/23/2004 11:20	21FLSFWMCOCAT41	106	43	59
1/29/2004 11:50	21FLSFWMCOCAT41	108	43	60
4/21/2005 11:40	21FLSFWMBC13	113	43	62
10/9/2001 12:35	21FLSFWMCOCAT41	114	43	62
2/7/2006 13:56	21FLSFWMCOCAT41	115	43	63
4/19/2007 9:49	21FLSFWMBC13	115	43	63
3/27/2006 11:38	21FLSFWMBC13	118	43	64
10/17/2000 11:10	21FLSFWMBC13	120	43	64
10/12/2006 9:56	21FLSFWMCOCAT41	121	43	64
10/12/2006 10:52	21FLSFWMBC13	121	43	64
9/26/2002 11:57	21FLSFWMCOCAT41	123	43	65
1/13/2003 12:05	21FLSFWMCOCAT41	123	43	65
10/27/2005 14:00	21FLSFWMBC13	125	43	66
8/19/2003 14:00	21FLSFWMCOCAT41	126	43	66
9/12/2006 10:41	21FLSFWMBC13	128	43	66
3/22/2006	21FLFTM EVRGWC0024FTM	130	43	67
8/16/2006	21FLFTM EVRGWC0024FTM	130	43	67
9/12/2006 10:11	21FLSFWMCOCAT41	130	43	67
10/20/2003 12:35	21FLSFWMCOCAT41	133	43	68
11/30/2005 13:05	21FLSFWMBC13	133	43	68
1/23/2006 12:53	21FLSFWMCOCAT41	137	43	69
12/17/2003 12:10	21FLSFWMCOCAT41	140	43	69
6/11/2003 11:28	21FLSFWMCOCAT41	143	43	70
11/8/2001 12:51	21FLSFWMCOCAT41	144	43	70
11/8/2004 15:22	21FLSFWMCOCAT41	147	43	71
11/30/2005 13:58	21FLSFWMCOCAT41	160	43	73
5/21/2003 12:00	21FLSFWMCOCAT41	170	43	75
2/13/2006	21FLFTM EVRGWC0024FTM	170	43	75
8/16/2006	21FLFTM EVRGWC0025FTM	170	43	75
4/19/2007 9:15	21FLSFWMCOCAT41	180	43	76
12/6/2001 12:30	21FLSFWMCOCAT41	185	43	77
9/23/2003 13:55	21FLSFWMCOCAT41	185	43	77
7/11/2001 11:30	21FLSFWMBC13	190	43	77
10/16/2002 10:55	21FLSFWMBC13	197	43	78
10/27/2005 15:25	21FLSFWMCOCAT41	198	43	78
11/12/2002 11:45	21FLSFWMCOCAT41	200	43	79
12/16/2002 10:54	21FLSFWMCOCAT41	200	43	79
2/13/2006	21FLFTM 28030036	200	43	79

Date/Time	Station	Fecal Coliform Exceedance	Fecal Coliform Target	% Reduction
9/11/2006	21FLFTM 28030036	200	43	79
8/14/2002 11:00	21FLSFWMCOCAT41	208	43	79
9/12/2001 12:05	21FLSFWMCOCAT41	210	43	80
8/16/2006	21FLFTM 28030036	220	43	80
3/7/2002 11:50	21FLSFWMCOCAT41	230	43	81
2/13/2001 11:44	21FLSFWMCOCAT41	240	43	82
10/9/2001 11:45	21FLSFWMBC13	290	43	85
2/26/2004 12:23	21FLSFWMCOCAT41	290	43	85
9/12/2001 11:07	21FLSFWMBC13	320	43	87
6/20/2002 10:10	21FLSFWMBC13	330	43	87
6/11/2003 10:30	21FLSFWMBC13	330	43	87
8/15/2005 13:12	21FLSFWMCOCAT41	367	43	88
10/16/2002 11:43	21FLSFWMCOCAT41	370	43	88
8/17/2006 12:11	21FLSFWMCOCAT41	410	43	90
7/18/2002 12:40	21FLSFWMCOCAT41	430	43	90
7/11/2001 12:15	21FLSFWMCOCAT41	460	43	91
6/20/2002 11:12	21FLSFWMCOCAT41	460	43	91
5/20/2002 12:10	21FLSFWMCOCAT41	480	43	91
10/17/2000 11:55	21FLSFWMCOCAT41	520	43	92
2/28/2005 12:54	21FLSFWMCOCAT41	570	43	92
1/24/2002 12:00	21FLSFWMCOCAT41	710	43	94
7/18/2002 11:50	21FLSFWMBC13	740	43	94
3/10/2003 10:38	21FLSFWMBC13	960	43	96
9/29/2005 12:04	21FLSFWMBC13	960	43	96
			Median % Reduction:	65

Table 5.2. Statistical Table of Observed Historical Data by Month and Season for the Cocohatchee River Estuary, WBID 3259A

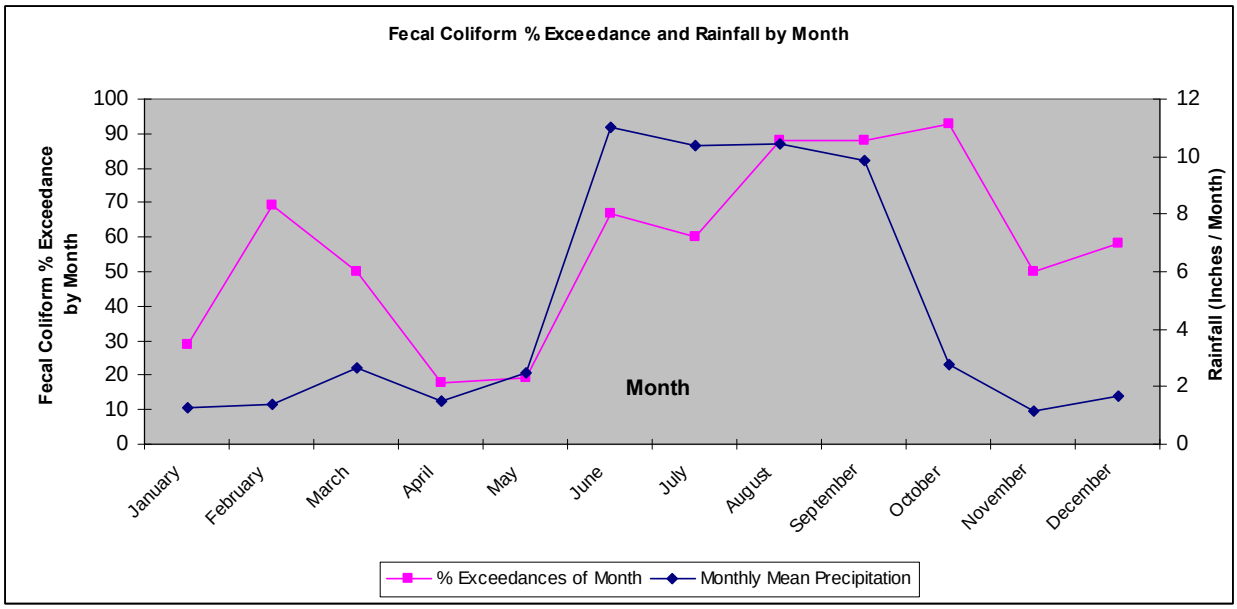
Month	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
January	14	1	710	22	88	4	29	1.29
February	16	2	570	64	124	11	69	1.38
March	16	1	960	40	115	8	50	2.63
April	17	1	180	14	36	3	18	1.51
May	16	1	480	23	59	3	19	2.50
June	12	19	460	77	137	8	67	11.00
July	15	1	740	58	154	9	60	10.37
August	16	1	410	95	137	14	88	10.43
September	16	20	960	115	175	14	88	9.89
October	14	24	520	123	179	13	93	2.79
November	14	1	200	68	77	7	50	1.14
December	12	17	200	56	79	7	58	1.67
Season	**N**	**Minimum**	**Maximum**	**Median**	**Mean**	**No. of Exceedances**	**% Exceedance**	**Mean Precipitation**
Winter	40	1	520	100	113	27	68	1.87
Spring	45	1	480	26	71	14	31	5.01
Summer	47	1	960	99	155	37	79	10.23
Fall	46	1	960	42	110	23	50	1.77

Coliform counts are #/100mL
Exceedances represent values above 43 counts/100mL for fecal coliform.
Mean precipitation is from the Lee County rain gage at Bonita Springs Utilities, available at the following websites:
http://www.lee-county.com/naturalresources/hydromonitor/Autopage_T27_R20.htm and
http://www.lee-county.com/naturalresources/hydromonitor/Autopage_T27_R297.htm.

Table 5.3. Summary of Coliform Data by Year for the Verified Period (January 1, 2000–June 30, 2007)

Year	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
2000	6	20	520	77	142	4	67	5.29
2001	23	2	460	78	113	13	57	6.51
2002	23	10	740	197	221	16	70	4.16
2003	22	4	960	99	139	16	73	5.90
2004	24	2	290	41	59	12	50	4.26
2005	24	2	960	80	142	16	67	5.66
2006	53	1	410	21	62	21	40	3.51
2007	3	88	180	115	128	3	100	2.43

Coliform counts are #/100mL
Exceedances represent values above 43 counts/100mL for fecal coliform.
Mean precipitation is from the Lee County rain gage at Bonita Springs Utilities, available at the following websites:
http://www.lee-county.com/naturalresources/hydromonitor/Autopage_T27_R20.htm and
http://www.lee-county.com/naturalresources/hydromonitor/Autopage_T27_R297.htm.



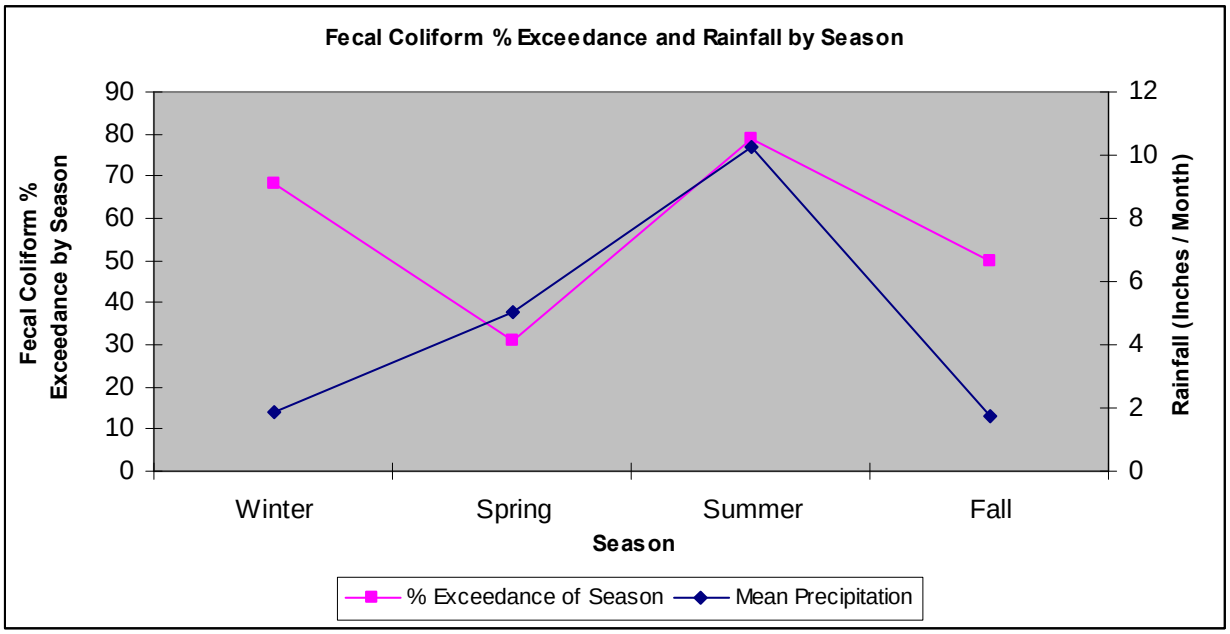


Figure 5.2. Fecal Coliform Exceedances and Rainfall by Month and Season, 2000–07, for the Cocohatchee River Estuary, WBID 3259A

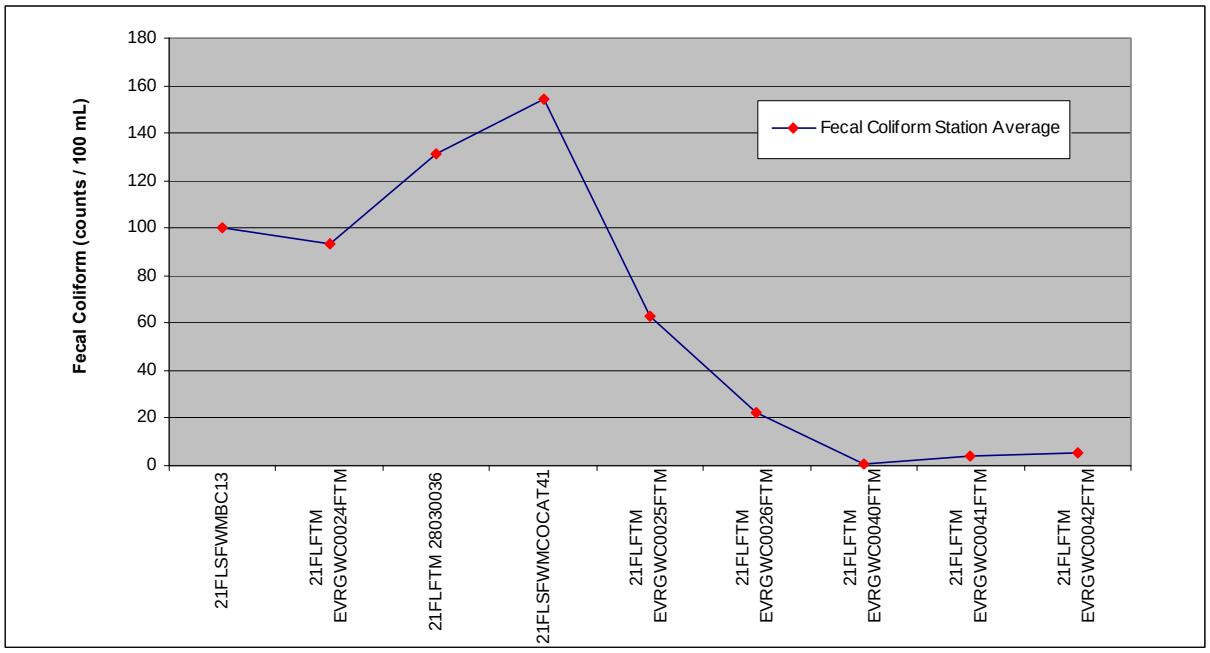


Figure 5.3. Monitoring Station Averages for Fecal Coliform in the Cocohatchee River Estuary, WBID 3259A

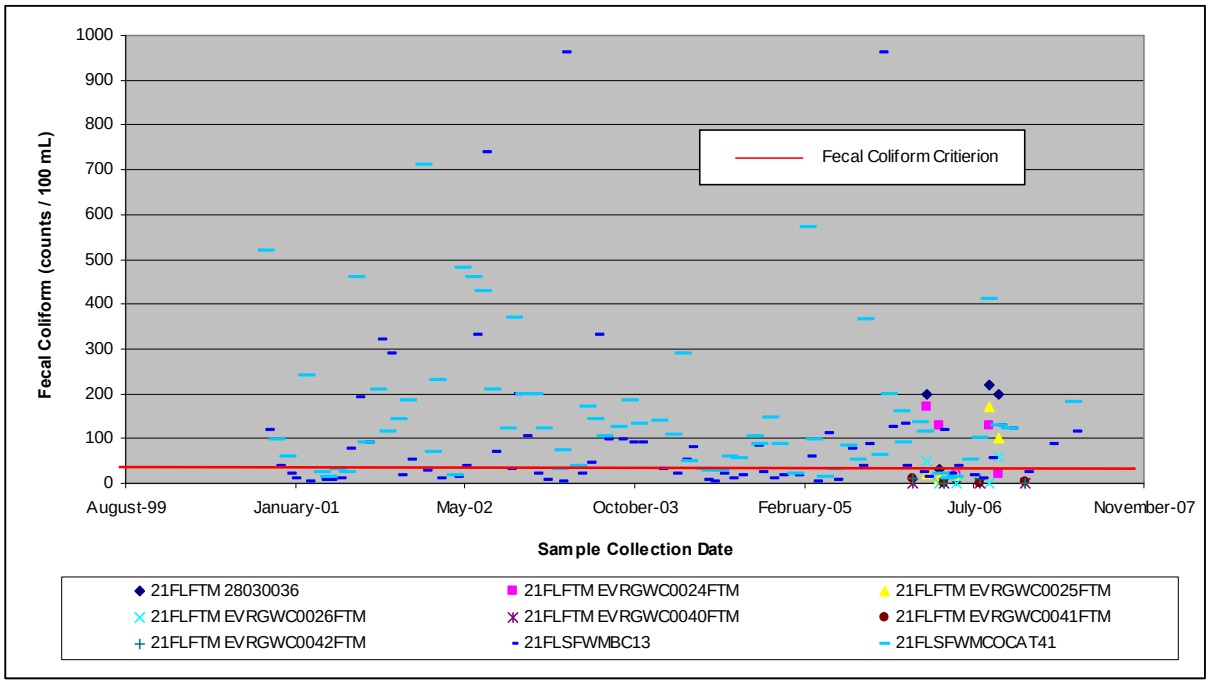


Figure 5.4. Temporal Trend of Fecal Coliform Concentrations in the Cocohatchee River Estuary, WBID 3259A

5.1.2 TMDL Development Process

As described in **Section 5.1**, the percent reduction needed to meet the fecal coliform criterion was determined for each individual exceedance using the following equation:

$$(2)\ \frac{[\text{measured exceedance} - \text{criterion}]*100}{\text{measured exceedance}}$$

The fecal coliform TMDL was calculated as the median of the percent reductions needed over the data range where exceedances occurred (see **Table 5.1** for data). As noted in the next section, exceedances occurred in each calendar month, and the median percent reduction for this period was 65 percent.

5.1.3 Critical Conditions/Seasonality

Exceedances in the Cocohatchee River occur throughout the year and because of the lack of matching flow data are assumed to happen under all flow conditions.

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:

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

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

$$\mathbf{TMDL \cong \sum WLAs_{wastewater} + \sum WLAs_{NPDES\ Stormwater} + \sum LAs + MOS}$$

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 TMDL for the Cocohatchee River Estuary is expressed in terms of counts/100mL and represents the maximum daily fecal coliform load the estuary can assimilate and maintain to meet the coliform criterion (**Table 6.1**).

Table 6.1. TMDL Components and Current Loadings for the Cocohatchee River Estuary, WBID 3259A

WBID	Parameter	TMDL (counts/day)	WLA		LA (% Reduction)	MOS
			Wastewater (lbs/year)	NPDES Stormwater (% Reduction)		
3259A	Fecal Coliform	43/100mL	N/A	65	65	Implicit

N/A – Not applicable.

6.2 Load Allocation

A fecal coliform reduction of 65 percent is required from nonpoint sources. It should be noted that the load allocation includes loading from stormwater discharges that are not part of the NPDES Stormwater Program.

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

As mentioned previously, there are no permitted wastewater facilities with a discharge permit in the Cocohatchee River Estuary watershed. Any new potential dischargers are expected to comply with the Class II criterion for coliform bacteria.

6.3.2 NPDES Stormwater Discharges

Collier County has a Phase II MS4 permit (FLR04E037) that includes portions of the Cocohatchee River Estuary watershed and would be responsible for a 65 percent reduction in current anthropogenic fecal coliform loading from the MS4. 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, 2001), an implicit MOS was used in the development of this TMDL. An MOS was included in the TMDL by not allowing any exceedances of the state criterion, even though intermittent natural exceedances of the criterion would be expected and would be taken into account when determining impairment. Additionally, the TMDL calculated for fecal coliform is based on meeting the water quality criterion of 43 counts/100mL without any exceedances, while the actual criterion allows for 10 percent exceedances over the criterion.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the next step in the TMDL process is to develop an implementation plan for the TMDL, which will be a component of the Basin Management Action Plan (BMAP) for the Cocohatchee River Estuary and watershed. This document will be developed over the next year in cooperation with local stakeholders, who will attempt to reach a consensus on more detailed allocations and on how load reductions will be accomplished. The BMAP will include the following:

- *Appropriate allocations among the affected parties,*
- *A description of the load reduction activities to be undertaken,*
- *Timetables for project implementation and completion,*
- *Funding mechanisms that may be utilized,*
- *Any applicable signed agreement,*
- *Local ordinances defining actions to be taken or prohibited,*
- *Local water quality standards, permits, or load limitation agreements, and*
- *Monitoring and follow-up measures.*

The participants in the Cocohatchee River Estuary BMAP include, but is not limited to, the Department, Collier County, City of Bonita Springs, and FDACS.

References

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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, F.A.C., 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 Program 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 A: Public Comments and FDEP Responses

Appendix B.1: Mac Hatcher/Collier County Environmental Services Department.

The below comments were received by email from Mr. Mac Hatcher of the Collier County Environmental Services Department July 18, 2008

Comment 1: In Section 1.2 the Cocohatchee River WIBID 3259A is 0.42% percent of the Southwest Coast Planning Unit, not 42%.

FDEP Response: The planning unit percentage will be changed in the text to the correct amount.

Comment 2: In the last sentence the Cocohatchee River above the weir / spillway is a canal that is about 8.5 miles long. (There are very few "creeks" in Collier above the estuaries and just a couple of natural lakes.)

FDEP Response: The length of the Cocohatchee Canal will be revised to read 8.5 miles long based on the local information provided.

Comment 3: The Figure 4.2 would be easier to read and interpret if the land use breakdown was limited to Level 1 uses.

FDEP Response: Figure 4.2 will be revised to show only level 1 land use codes for the Cocohatchee River estuary.

Comment 4: I just want to double check which stations you may be excluding from the "reference" sites for the Gordon River Extension TMDL. Mac mentioned 21FLSFWMBC22 for possible exclusion. I would also exclude 21FLSFWMBC25 in WBID 3259I as it is directly downstream of most of the agriculture in this WBID. I'm sure that one was popping out as high for TN, TP, and BOD. The other sites you have listed in Table B.2 are OK for reference sites.

FDEP Response: WBID 3259I is no longer a reference WBID, station 21FLSFWMBC25 is no longer used to calculate TN reference concentration.

Florida Department of Environmental Protection
Division of Water Resource Management
Bureau of Watershed Management
2600 Blair Stone Road, Mail Station 3565
Tallahassee, Florida 32399-2400
www2.dep.state.fl.us/water/