FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTHWEST DISTRICT • SARASOTA BAY–PEACE–MYAKKA BASINS

TMDL Report

Fecal Coliform TMDL for Peace Creek Drainage Canal, WBID 1539

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February 28, 2007

Acknowledgments

This study could not have been accomplished without significant contributions from staff in the Florida Department of Environmental Protection's Watershed Assessment Section.

Editorial assistance provided by Daryll Joyner, Jan Mandrup-Poulsen, Kevin Petrus, and Linda Lord.

Map production assistance provided by Aaron Lassiter.

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Total Maximum Daily Load (TMDL) Program

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Identification of Impaired Surface Waters Rule

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

Florida 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

Water Quality Status and Assessment Reports for the Sarasota Bay–Peace–Myakka Basins

http://www.dep.state.fl.us/water/basin411/groups/group3.htm

Allocation Technical Advisory Committee (ATAC) Report

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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 bacteria for the Peace Creek Drainage Canal, which is located in the Upper Peace River Planning Unit and part of the larger Sarasota Bay–Peace–Myakka Basins. The canal was verified as impaired for fecal coliform bacteria, and was included on the Verified List of impaired waters for the Sarasota Bay–Peace–Myakka Basins that was adopted by Secretarial Order in June 2005. The TMDL establishes the allowable loadings to the Peace Creek Drainage Canal that would restore the waterbody so that it meets its applicable water quality criterion for fecal coliform bacteria.

1.2 Identification of Waterbody

The Peace Creek Drainage Canal, located in central Polk County within the Upper Peace Basin, covers 229 square miles (mi^2). Tributaries include Lake Fannie Outlet, Lake Hamilton Outlet, Peace Creek Tributary Canal near the city of Lake Wales, Wahneta Farms Drain Canal, and Lake Garfield Outlet. The adjacent land area draining directly to the canal is 52.7 mi^2 **(Figure 1.1).** Rainfall averages about 55 inches per year, with 70 percent occurring between May and October. The Peace Creek Drainage Canal was excavated in the early 1900s to drain low-lying lands in Polk County south of the Winter Haven Chain of Lakes. Frequent flooding still occurs in low areas near the canal, with large areas of standing water present for several months during some years. Part of this problem is unavoidable due to the watershed's flat topography.

Citrus is the primary crop in Polk County, although other agricultural activities, including livestock production, contribute significantly to the local economy. The Peace Creek Drainage Canal originates between Lakes Fannie and Hamilton, then flows southward to the vicinity of Lake Wales and then westward toward Bartow, where it joins Saddle Creek to form the Peace River. The canal flows for approximately 25 miles between the headwaters and the confluence with Saddle Creek. Water control structures on Lakes Lulu and Hamilton affect flows to the Peace Creek Canal and the Upper Peace River. Urban areas in the watershed include Auburndale, Winter Haven, Lake Alfred, Haines City, Lake Wales, Dundee, Lake Hamilton, Waverly, and Wahneta.

The Peace River watershed has a total surface area of 2,350 mi^2. Ninety percent of the watershed lies within Polk, Hardee, DeSoto, and Charlotte Counties, and the remainder is within Lee, Highlands, Manatee, Hillsborough, Glades, and Sarasota Counties. In 2000, the population of the watershed was about 366,000 people. By 2020, that number is projected to increase to approximately 480,000. Additional information about the region's hydrology and geology are available in the Sarasota Bay–Peace–Myakka Basins Status Report (Florida Department of Environmental Protection [Department], June 2003).

For assessment purposes, the Department divided the Upper Peace Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. The Peace Creek Drainage Canal is WBID 1539 **(Figure 1.2).**

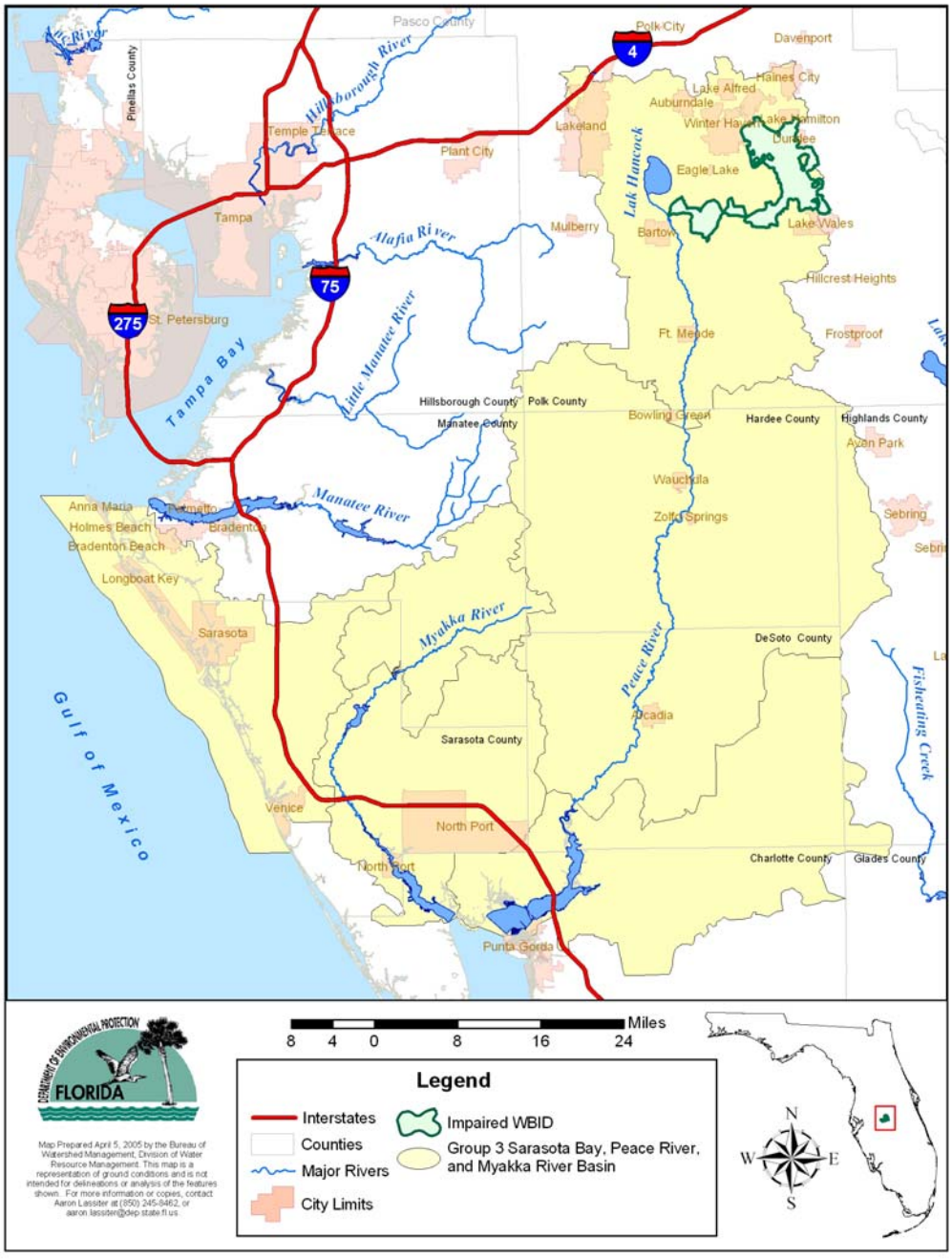


Figure 1.1. Location of the Peace Creek Drainage Canal, WBID 1539, and Major Geopolitical Features in the Sarasota Bay–Peace–Myakka Basins

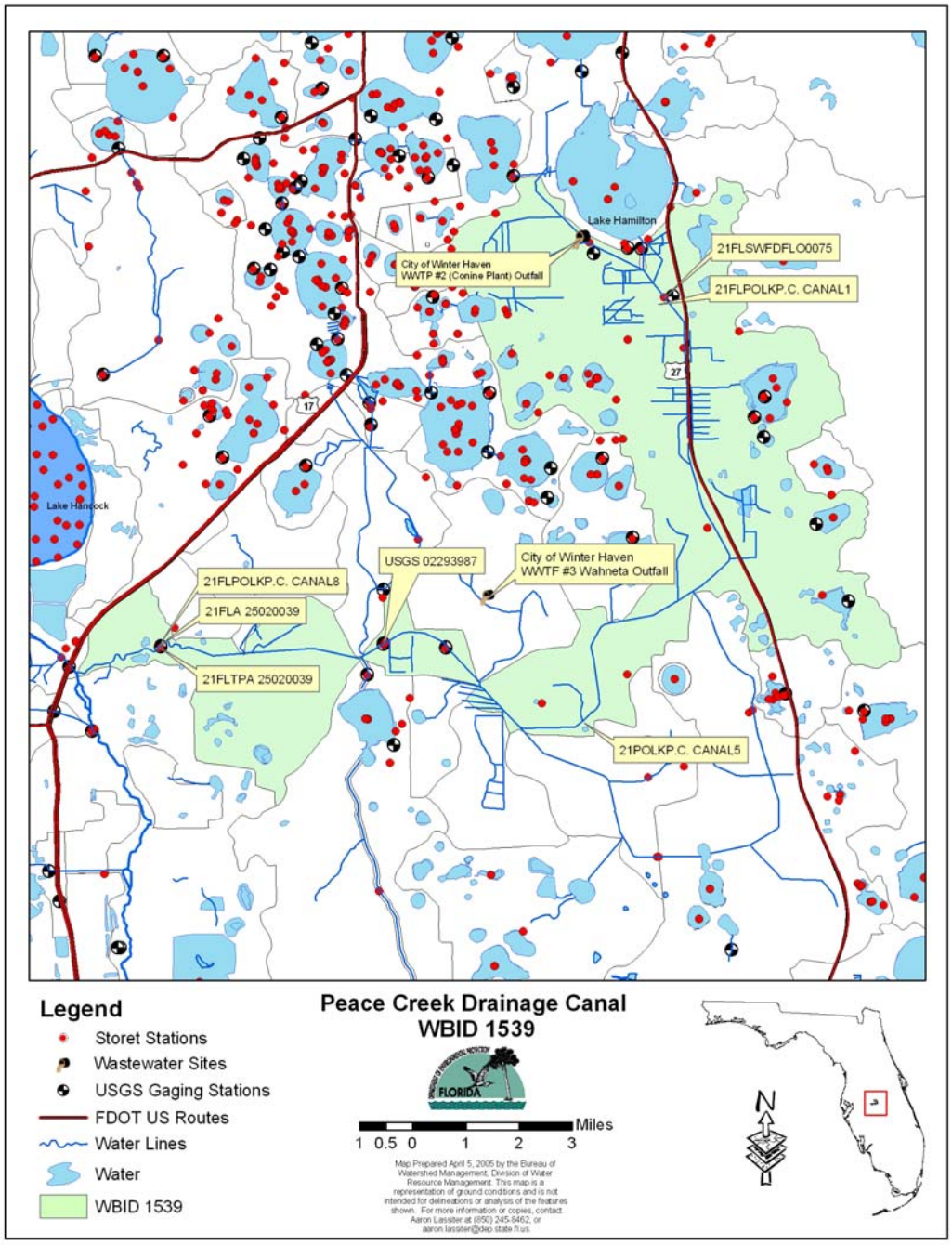


Figure 1.2. Peace Creek Drainage Canal, WBID 1539, and Monitoring Locations

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 reduce the amount of fecal coliform bacteria that caused the verified impairment in the Peace Creek Drainage Canal, WBID 1539. These activities will depend heavily on the active participation of the Southwest Florida Water Management District (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) a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant identified as causing the impairment of the 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.]), and the state's 303(d) list is amended annually to include basin updates.

Florida's 1998 303(d) list included 84 waterbodies in the Sarasota Bay–Peace–Myakka Basins. 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.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the Peace Creek Drainage Canal and verified the impairment for fecal coliform **(Table 2.1). Table 2.2** summarizes the data collected during the verification period (January 1, 1997–June 30, 2004). The canal segment was verified as impaired for fecal coliform because it was determined under the IWR methodology that more than 10 percent of the values exceeded the Class III freshwater criterion of 400 counts per 100 milliliters (counts/100mL) for fecal coliform (10 out of 39 samples in the verified period exceeded the criterion of 400 counts/100mL).

The verified impairments were based on data collected mainly by the Polk County Natural Resources Division and the Department. Polk County STORET stations include 21FLPOLKP.C. CANAL1, 21FLPOLKP.C. CANAL5, and 21FLPOLKP.C. CANAL8. The Department sampled at STORET Station 21FLA 25020039. **Figure 1.2** shows the locations of the sampling sites. **Figure 2.1** displays the fecal coliform data collected from December 1992 through April 2004, and **Appendix A** tabulates all available fecal coliform data for the Peace Creek Drainage Canal. Fecal coliform values exceeding the criterion of 400 counts/100mL during this period were used to develop the TMDL, as described in Chapter 5.

Table 2.1. Verified Impairment in the Peace Creek Drainage Canal, WBID 1539

Parameter Causing Impairment	Priority for TMDL Development	Projected Year for TMDL Development
Fecal Coliform	High	2004

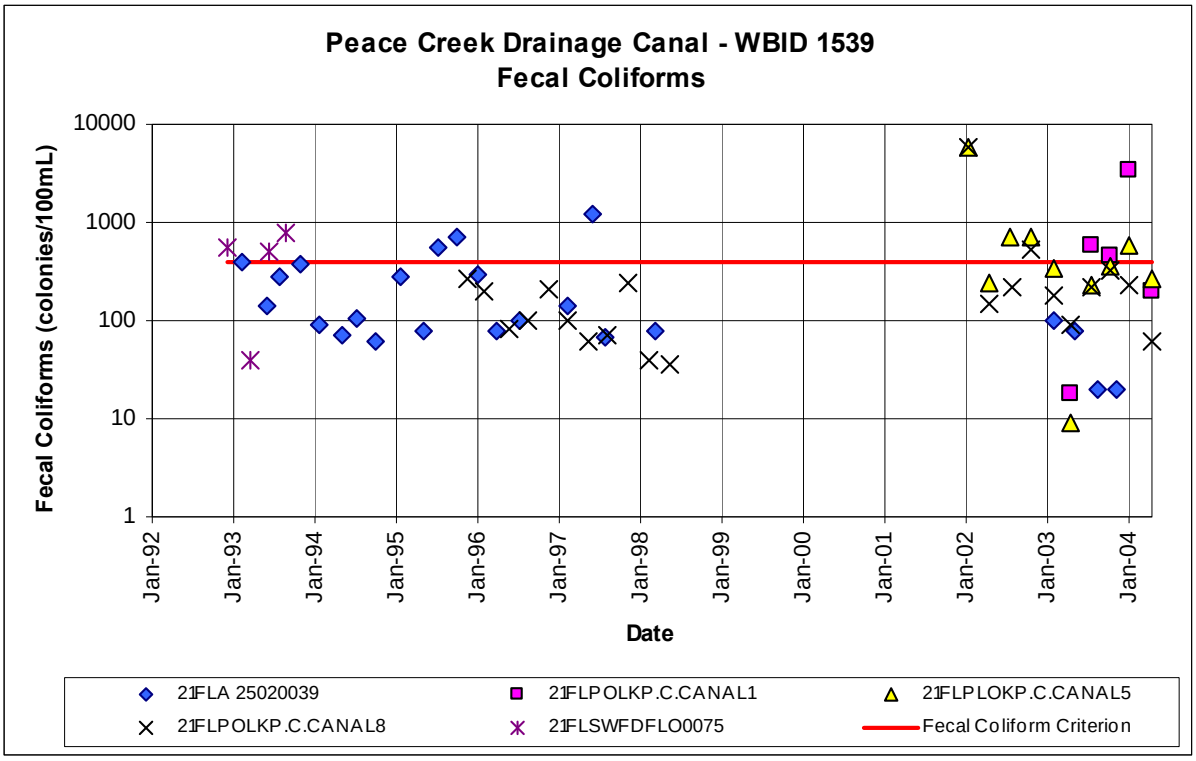
Note: This TMDL was scheduled to be completed by December 31, 2004, based on a Consent Decree between the EPA and EarthJustice, but the Consent Decree allows a nine-month extension for completing the TMDL.

Table 2.2. Summary of Fecal Coliform Data for the Peace Creek Drainage Canal, WBID 1539, January 1, 1997–June 30, 2004

Parameter Causing Impairment	Total Number of Samples	30-Day Geometric Mean	Percent Fecal Coliform Samples > 400 counts/100mL	Minimum Concentration (counts/100mL)	Maximum Concentration (counts/100mL)
Fecal Coliform	39	N/A	25.6	9	5,800

N/A = Not available

Figure 2.1. Fecal Coliform Measurements in the Peace Creek Drainage Canal, December 1992–April 2004



Chapter 3. DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS

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)**

The Peace Creek Drainage Canal is a Class III waterbody, with a designated use of recreation, propagation, and 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 fecal coliform bacteria.

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 III waters, as established by Rule 62-302, F.A.C., states the following:

> ***Fecal Coliform Bacteria:***
> *The most probable number (MPN) or membrane filter (MF) counts per 100 mL of fecal coliform bacteria shall not exceed a monthly average of 200, nor exceed 400 in 10 percent of the samples, nor exceed 800 on any one day.*

For fecal coliform, 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, during the development of load curves for the impaired canal (as described in subsequent chapters), 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 development of the TMDL is that values are not to exceed 400 counts/100mL in more than 10 percent of the samples. The 10 percent exceedance allowed by the water quality criterion was not used directly in estimating the target load, but was included in the TMDL margin of safety (MOS) (described in **Section 6.4**).

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 the pollutant causing impairment 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 5 acres, and a wide variety of industries (see **Appendix B** 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 Bacteria in the Peace Creek Drainage Canal Watershed

4.2.1 Point Sources

There is one active permitted domestic wastewater treatment facility that discharges fecal coliform loads indirectly into the Peace Creek Drainage Canal. The city of Winter Haven, WWTP #3 (Wahneta Plant, NPDES No. FL0036048), a 5-million-gallon-per-day (mgd) Type I WWTP, discharges to a 150-acre overland flow system, and the effluent is collected in an open ditch and discharged through D001 into an unnamed tributary of the Peace Creek Drainage Canal **(Figure 1.2)**. The city of Winter Haven WWTP #2 (Conine Plant, NPDES No. FL0021849) possessed a permit for a limited wet weather discharge to the Peace Creek Drainage Canal, but the outfall has not been used. This permit expired on June 25, 2003, and has since become a water reuse permit (NPDES No. FLA129747), which will expire on December 30, 2008 **(Figure 1.2)**.

Municipal Separate Storm Sewer System Permittees

Municipal separate storm sewer systems (MS4s) may also discharge pollutants to waterbodies in response to storm events. To address stormwater discharges, the EPA developed the NPDES stormwater permitting program in two phases. Phase 1, promulgated in 1990, addresses large and medium-size MS4s located in incorporated areas and counties with populations of 100,000 or more. Phase 2 permitting began in 2003. Regulated Phase 2 MS4s are defined in Section 62-624.800, F.A.C., and typically cover urbanized areas serving jurisdictions with a population of at least 10,000 or discharging into Class I or Class II waters, or into Outstanding Florida Waters.

The stormwater collection systems in the Peace Creek Drainage Canal watershed, which are owned and operated by Polk County in conjunction with the Florida Department of Transportation (FDOT) District 1, are covered by a Phase 1 MS4 permit. Currently, no local governments in the watershed have applied for coverage under the Phase 2 NPDES MS4 permit.

The Peace Creek Drainage Canal falls under the Polk County Phase 1 MS4 permit (No. FLS000015). The cities of Lake Wales and Winter Haven, and the towns of Dundee and Lake Hamilton, all of which have portions of their jurisdictions located within the WBID, are copermittees.

4.2.2 Land Uses and Nonpoint Sources

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

Wildlife

Wildlife deposit coliform bacteria with their feces onto land surfaces, where they can be transported during storm events to nearby streams. Some wildlife (such as otters, beavers, raccoons, and birds) deposit their feces directly into the water. The bacterial load from naturally occurring wildlife is assumed to be background. In addition, any strategy employed to control this source would probably have a negligible impact on attaining water quality standards.

Agricultural Animals

Agricultural animals are the source of several types of coliform loading to streams. Agricultural activities, including runoff from pastureland and cattle in streams, can affect water quality. **Table 4.1** lists 2002 livestock data for Polk County (U.S. Department of Agriculture, 2002).

Land Uses

The spatial distribution and acreage of different land use categories were identified using the SWFWMD 1999 land use coverage (scale 1:40,000) contained in the Department's geographic information system (GIS) library. Land use categories in the watershed were aggregated using the simplified Level 1 codes **(Table 4.2). Figure 4.1** shows the acreage of the principal land uses in the watershed. Agriculture predominates, comprising approximately 45.7 percent of land use. The other significant land use is urban and built-up (27.1 percent), while natural land uses (water and wetlands) represent approximately 17.1 percent.

Table 4.1. Livestock Distribution for Polk County, 2002

Livestock Distribution	Polk County (number of livestock)
Cattle/Calves	108,126
Milk cows	888
Hogs/Pigs	893
Poultry layers > 13 weeks	(D)
Poultry broilers	144
Sheep/Lambs	125
Horses	2,562

(D) – Data withheld to avoid disclosing data for individual farms.
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, 2002.

Table 4.2. Classification of Land Use Categories in the Peace Creek Drainage Canal Watershed, WBID 1539

Code	Land Use	Acreage	% of Total
1000	Urban open	4,356	12.89%
1100	Low-density residential (< 2 dwelling units/acre)	1,882	5.57%
1200	Medium-density residential (2-5 dwelling units/acre)	1,938	5.73%
1300	High-density residential (6 or more dwelling units/acre)	991	2.93%
2000	Agriculture	15,434	45.66%
3000	Rangeland	652	1.93%
4000	Upland forests	2,316	6.85%
5000	Water	806	2.38%
6000	Wetlands	4,966	14.69%
7000	Barren land	49	0.14%
8000	Transportation, communication, and utilities	412	1.22%
	TOTAL:	**33,802**	**100**%

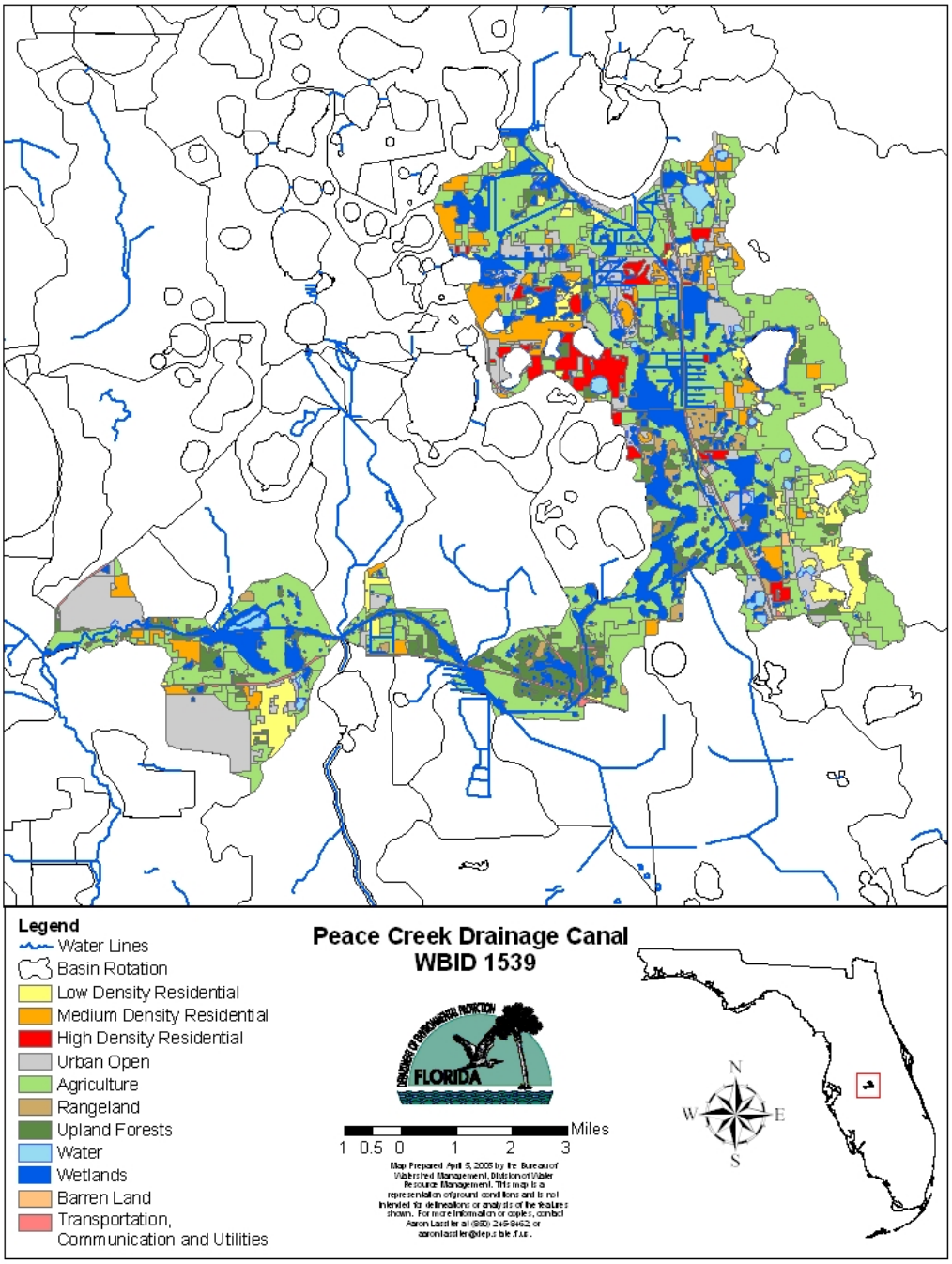


Figure 4.1. Principal Land Uses in the Peace Creek Drainage Canal Watershed, WBID 1539, in 1999

Urban Development

Coliform loading from urban areas is attributable to multiple sources, including stormwater runoff, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, runoff from improper disposal of waste materials, leaking septic systems, and domestic animals.

Since 14 percent of the land area in the watershed is residential, it is possible that pets, especially dogs, are having an impact on the Peace Creek Drainage Canal. The Department has been unable to obtain data on the number of dogs in the area; however, estimates can be made using household-to-dog ratio estimates from the American Veterinary Medical Association (AVMA) **(Table 4.3).** Assuming that 10 percent of coliform reach the waterbody and are viable upon reaching it, the approximate loading would be 1.81×10^{12} organisms/day. This is an estimate, as the actual loading from dogs is not known.

Table 4.3. Estimated Loading from Dogs in the Peace Creek Drainage Canal Watershed, WBID 1539

Pet	Estimated Number of Households in 1539	Estimated Household: Pet Ratio[1]	Estimated Total Dog Population in Watershed	Estimated Loading of Total	Estimated Number of Pets with Impact to Canal	Estimated Counts/Pet/Day[2]	Estimated Counts/Day
Dogs	10,028	0.361	3,620	10%	362	5.0E+9	1.81E+12

[1] From the AVMA Web site, which states the original source to be the *U.S Pet Ownership and Demographics Sourcebook*, 2002.
[2] From *Protocol for Developing Pathogen TMDLs* (EPA, January 2001).

Population

According to the U.S. Census Bureau, the population density in Polk County in the year 2000 was at or less than 258.2 people per square mile **(Table 4.4).** The Census Bureau reports that the total population in 2000 for Polk County, which includes (but is not exclusive to) WBID 1539, was 483,924, with 226,376 housing units. For all of Polk County, the bureau reported a housing density of 120.8 houses per square mile. Polk County is just below the average housing density of Florida, with an average of 134.3 housing units per square mile (U.S. Census Bureau Web site, 2004). **Figure 4.2** displays the population density in the area of the Peace Creek Drainage Canal in 2000.

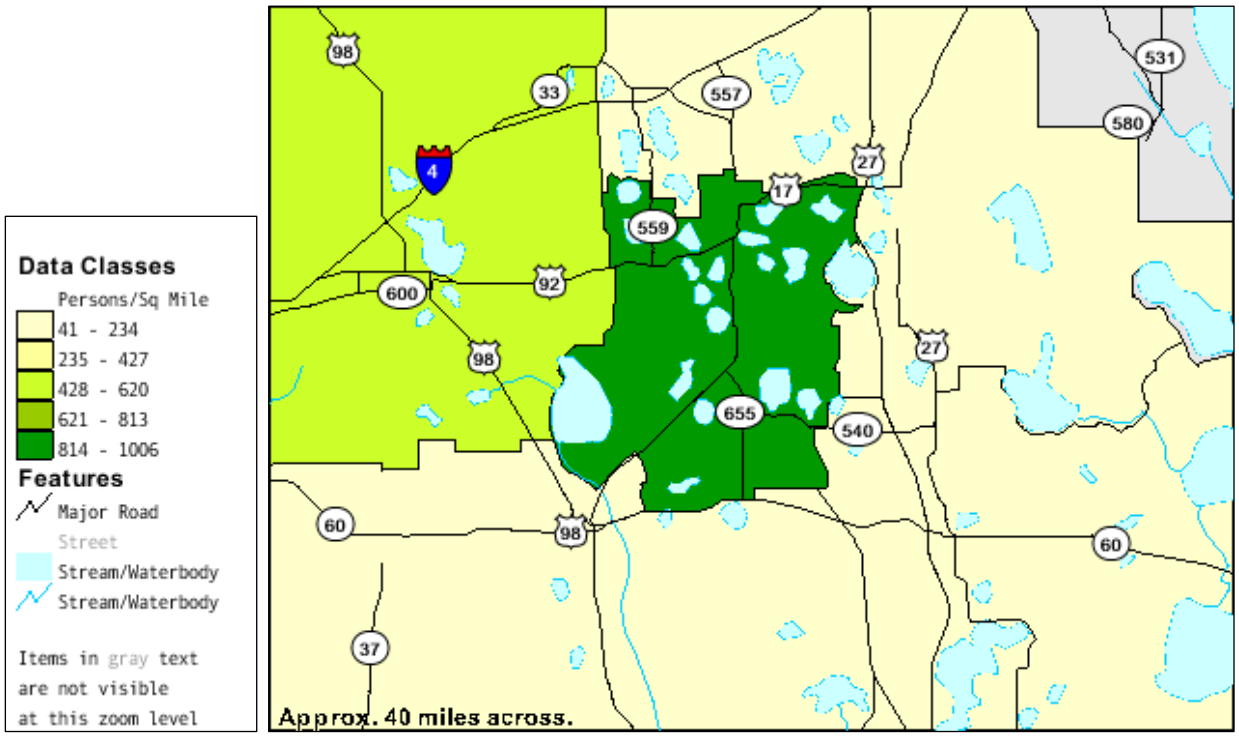


Figure 4.2. Population Density in the Area of the Peace Creek Drainage Canal, WBID 1539, in 2000

Table 4.4. Population Density in Polk County, Florida, in 2000

Persons per Square Mile	Total Population	Houses per Square Mile	Housing Units
258.2	483,924	120.8	226,376

Source: U.S. Census Bureau Web site, 2005.

Septic Tanks

Data for septic tanks are based on the 1970 census results, with year-by-year additions based on new septic tank construction. The data do not reflect septic tanks that have been removed. Polk County has a cumulative registry of 112,848 septic tanks. With 226,376 households in the county, this means that approximately 50 percent of the residences in the county are connected to wastewater treatment plants, with the remainder (50 percent) using septic tanks (Florida Department of Health [FDOH] Web site, 2005).

Based on 2000 U.S. Census Bureau data, there are an estimated 548 persons/mi^2 in the WBID, or 23,999 for the watershed. The average household in the Peace Creek Drainage Canal watershed has 2.39 persons (see **Table 4.5**). According to the FDOH, there is an annual

average of 1,256 repairs (fiscal years 1993–2004) in Polk County. Based on this information, and assuming that the failures are spread evenly throughout the county, there are approximately 29.3 failures in the Peace Creek Drainage Canal watershed annually. Using 70 gallons/day/person (EPA, January 2001), a loading of 1.86E+11 colonies/day is derived. **Table 4.6** shows the calculations for this estimation.

Table 4.5. Estimation of Average Household Size in the Peace Creek Drainage Canal Watershed, WBID 1539, in 2000

Household Size	Number of Households	% of Total	Number of People
1-person household	2,432	24.25%	2,432
2-person household	4,402	43.90%	8,804
3-person household	1,315	13.11%	3,945
4-person household	1,049	10.46%	4,196
5-person household	495	4.94%	2,475
6-person household	197	1.97%	1,184
7-or-more-person household	138	1.37%	963
TOTAL:	**10,028**	**100.00%**	**23,999**
		AVERAGE HOUSEHOLD SIZE:	**2.39**

Note: Data from U.S. Census Bureau Web site, 2005, based on Polk County tracts 128, 139.02, 140.01, 140.02, 137.02, 141.23, 141.22, 144, 142.01, 143.02, 153.02, 145.01, and 153.01, in the Peace Creek Drainage Canal watershed.

Table 4.6. Estimation of Annual Fecal Coliform Loading from Failed Septic Tanks in the Peace Creek Drainage Canal Watershed, WBID 1539

Estimated Population Density and Area	WBID Area (mi^2)	Estimated Population in WBID	Estimated Number of Tank Failures[1]	Estimated Load from Failed Tanks[2]	Gallons/ Person/Day[2]	Estimated Number of Persons Per Household[3]	Estimated Load from Failing Tanks (counts/day)
548 persons/mi^2 in WBID 1539	52.7	23,999	29.3	1.00 x 10^4/mL	70	2.39	1.86E+11

[1] Based on septic tank repair permits issued in the watershed from March 1990 to April 2004 (FDOH); see text.
[2] From *Protocol for Developing Pathogen TMDLs* (EPA, January 2001).
[3] From the U.S. Census Bureau; see **Table 4.5** for more information on this estimate.

Domestic Sludge

When domestic wastewater is treated, solid material accumulates in the WWTP and must be removed periodically to keep the plant operating properly. The collected material, called "residuals," "biosolids," or more commonly, "sewage sludge," is the byproduct of these processes. The land application of sludge from domestic wastewater treatment facilities is a potential source of coliform bacteria loading to surrounding surface waters.

In the Peace Creek Drainage Canal watershed, there are two areas of residual land application **(Figure 4.3)**. The Buck Mann Ranch residual site, located just west of Lake Annie, has a 615-acre application area within WBID 1539, and the Stokes Cattle Company has a 303-acre application area in the watershed, located approximately 1.5 miles upstream of the confluence with the Wahneta Farms Drain Canal.

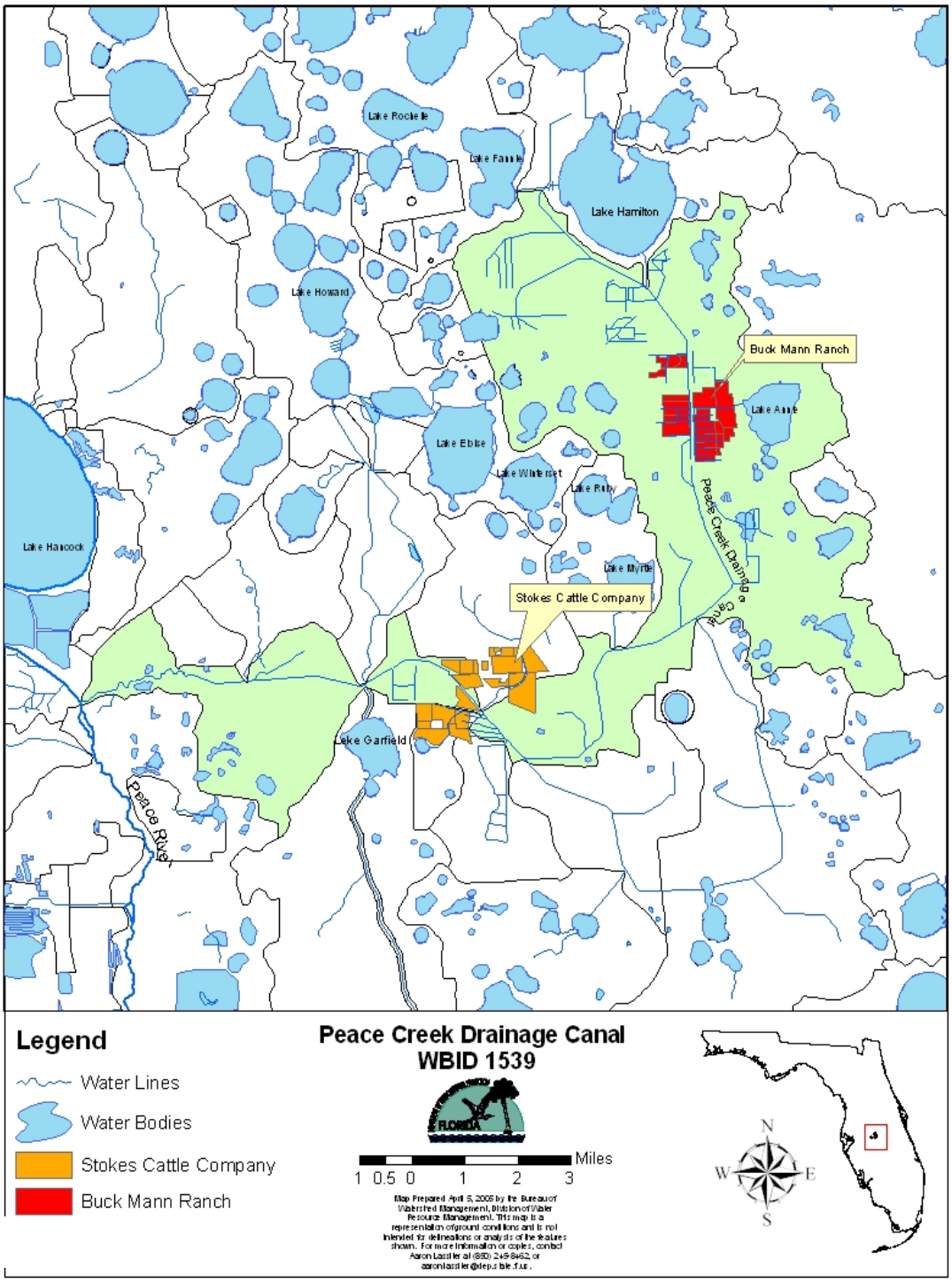


Figure 4.3. Domestic Sludge Application Sites in the Peace Creek Drainage Canal Watershed, WBID 1539

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Method Used To Determine Loading Capacity

The methodology used for this TMDL is the "load duration curve." Also known as the "Kansas Approach" because it was developed by the state of Kansas (Stiles, 2002), this method has been well documented in the literature, with improved modifications used by EPA Region 4 (EPA, July 2004). Basically, the method relates the pollutant concentration to the flow of the stream to establish the existing loading capacity and the allowable pollutant load (TMDL) under a spectrum of flow conditions. It then determines the maximum allowable pollutant load and load reduction requirement based on the analysis of the critical flow conditions. Using this method, it takes five steps to develop the TMDL and establish the required load reduction:

1. *Identify available flow and water quality data,*
2. *Develop the flow duration curve,*
3. *Develop the load duration curve for the existing loading,*
4. *Define the critical conditions, and*
5. *Establish the needed load reduction by comparing the existing loading with the allowable load under critical conditions.*

5.2 Data Used in the Determination of Loading Capacity

Fecal coliform bacteria concentrations and flow measurements were used to estimate both the allowable and existing coliform loads. In the Peace Creek Drainage Canal watershed, the primary collectors of water quality data are the Polk County Natural Resources Division and the Department. Polk County STORET stations are 21FLPOLKP.C. CANAL1, 21FLPOLKP.C. CANAL5, and 21FLPOLKP.C. CANAL8. The Department sampled STORET Station 21FLA 25020039. **Figure 1.2** shows the locations of these sites, while **Table 2.2** provides a brief statistical overview of the observed data at the sites. **Figure 2.1** displays the data for fecal coliform used in this analysis, and **Appendix A** lists the water quality monitoring results for fecal coliform.

Flow measurements for this report were obtained from a U.S. Geological Survey (USGS) gaging station located on the Peace Creek Drainage Canal (USGS 02293987, Peace Creek Drainage Canal near Wahneta, Florida, Latitude 27°55'28", Longitude 81°43'37") **(Figure 1.2).**

5.3 TMDL Development Process

The range of flows from the USGS flow gage was divided into "flow zones." The concept of zones is adopted from Dr. Bruce Cleland (Cleland, August 15, 2002). Their purpose is to demarcate hydrologic conditions between drought and peak flood into flow ranges such as low, dry, average, moist, and high.

Expressing the flows in terms of frequency of recurrence (duration) allows exceedances of the criterion to be linked to specific flow intervals and durations. For example, if all of the

exceedances were to occur during low-flow conditions, point sources of the pollutant would be suspected. Conversely, if all the exceedances were to take place during higher flow periods, then nonpoint sources of pollution would be suspected. Following Dr. Cleland's approach (Cleland, September 2003), the Department selected the following flow zones: "High" (0–10), "Moist" (11–40), "Mid-Range" (41–60), "Dry" (61–90), and "Low" (91–100). **Figure 5.1** shows the flow duration curve for USGS Gage 02293987.

Using the flows from the flow duration curve, load duration curves for fecal coliform bacteria **(Figure 5.2)** were calculated using the following equation:

(1) (observed flow) x (conversion factor) x (state criteria) = ([parameter quantity]/day or daily load)

The above equation yields the load duration curve or allowable load curve, shown as the fecal coliform target line in **Figure 5.2.** Using Equation 1 (above), fecal coliform loads **(Table 5.1)** were calculated, substituting the observed coliform exceedances for the state criterion value. Fecal coliform observations were then plotted, and it was noted where the samples were in relation to the allowable load curve (above or below the curve). Those above the curve **(Figure 5.2)** are noted as exceedances of the state criterion and are indicated by a purple square.

Figure 5.1. Flow Duration Curve for USGS Gage 02293987, 1991–2005

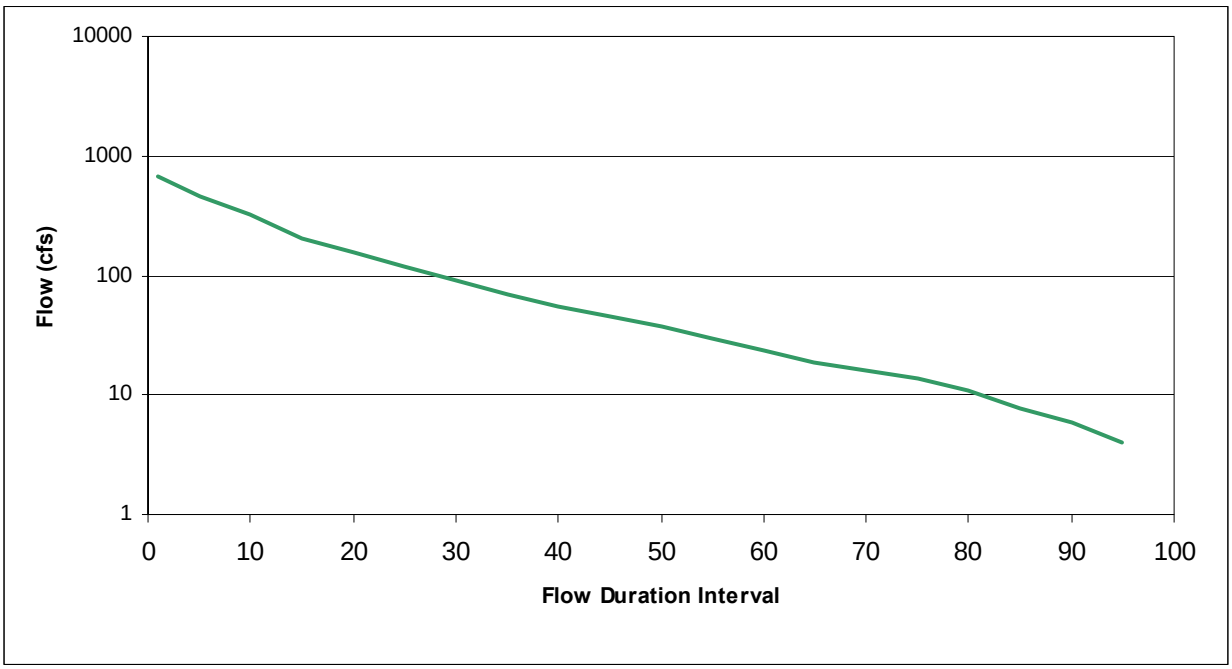


Figure 5.2. Load Duration Curves for Fecal Coliform in the Peace Creek Drainage Canal, WBID 1539

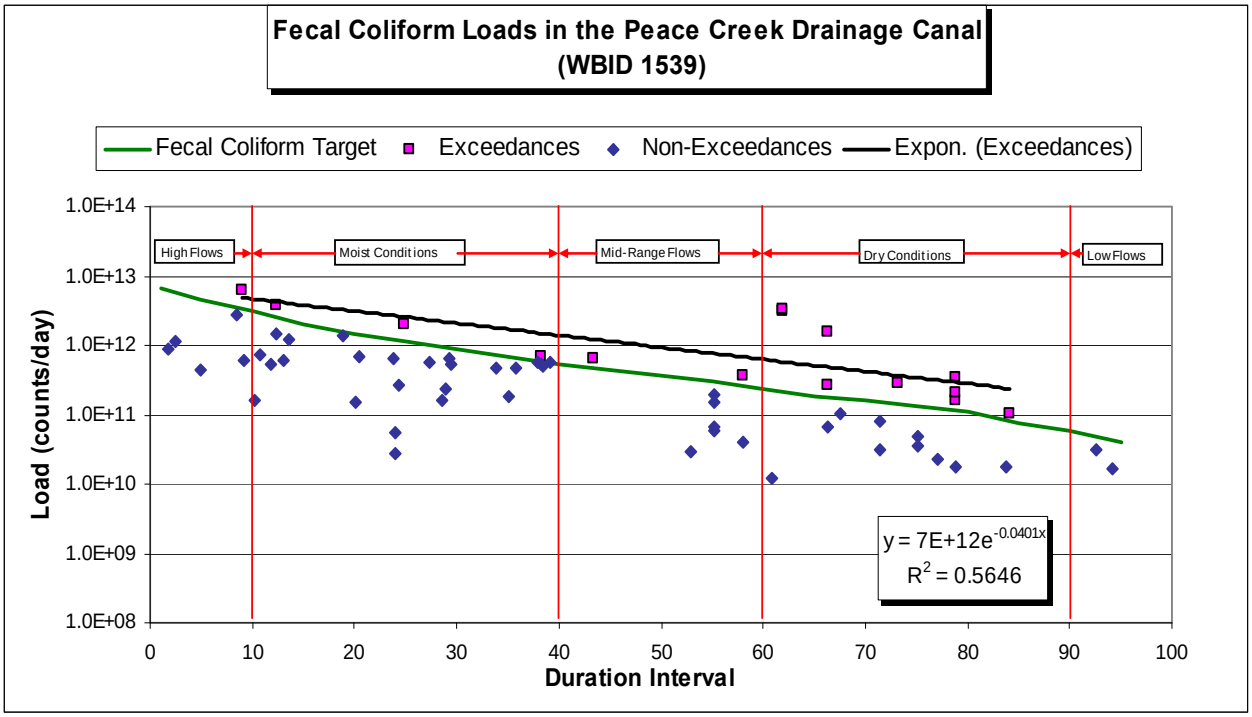


Table 5.1. Observed Fecal Coliform Data for Calculating Exceedances to the State Fecal Coliform Criterion for the Peace Creek Drainage Canal, WBID 1539, 1992–2004

Station	Sample Date	Sample Time	Flow (cfs*)	Flow Rank	Flow Rank (%)	Fecal Coliform (counts/100mL)	Fecal Coliform Load (counts/day)	Remark Code[1]
21FLPOLKP.C. CANAL1	10/7/2003	820	61	38.2%	38.2	460	6.87E+11	
21FLSWFDFLO0075	6/9/1993	830	8.2	84.2%	84.2	500	1.00E+11	Q
21FLPOLKP.C. CANAL8	10/23/2002	950	12	78.8%	78.8	530	1.56E+11	
21FLSWFDFLO0075	12/7/1992	0	49	43.3%	43.3	550	6.59E+11	Q
21FLA 25020039	7/12/1995	1335	27	58.0%	58	555	3.67E+11	
21FLPOLKP.C. CANAL5	1/6/2004	900	19	66.3%	66.3	570	2.65E+11	
21FLPOLKP.C. CANAL1	7/22/2003	800	257	12.4%	12.4	590	3.71E+12	
21FLPOLKP.C. CANAL5	10/22/2002	845	12	78.8%	78.8	706	2.07E+11	B
21FLPOLKP.C. CANAL5	7/23/2002	845	118	24.9%	24.9	714	2.06E+12	B
21FLA 25020039	10/4/1995	1205	354	9.0%	9	720	6.24E+12	
21FLSWFDFLO0075	8/24/1993	1145	15	73.2%	73.2	770	2.83E+11	Q
21FLA 25020039	6/2/1997	1300	12	78.8%	78.8	1,200	3.52E+11	L
21FLPOLKP.C. CANAL1	1/6/2004	755	19	66.3%	66.3	3,400	1.58E+12	
21FLPOLKP.C. CANAL5	1/15/2002	900	23	61.9%	61.9	5,700	3.21E+12	
21FLPOLKP.C. CANAL8	1/15/2002	1000	23	61.9%	61.9	5,800	3.26E+12	E

Note: Flow and concentration data analyzed for the TMDL were from December 1992 through April 2004. The Group 3 verification period is from January 1, 1997 to June 30, 2004. Flow data were from USGS Gage 02293987, located in WBID 1539. Data are sorted from lower to higher coliform counts.

[1] **Remark Code:** *B – Results based on colony counts outside the acceptable range.*
E – Extra samples taken at composite stations.
L – Actual value is known to be greater than value given.
Q – Sample held beyond normal holding time.

* cfs – cubic feet per second.

As noted previously, values on the load duration curve can generally be grouped by hydrologic conditions to identify the most likely potential sources. Exceedances falling into the 10th through 40th percentiles are typically associated with moist conditions when stormwater loads are the most likely source, and exceedances falling into the 60th through 90th percentiles are typically associated with dry conditions when point sources are likely the dominant source. As shown in **Figure 5.2**, the lowest number of fecal coliform exceedances in the Peace Creek Drainage Canal is associated with higher flow conditions, with only 1 exceedance in the 0 to 10th percentiles and 3 exceedances in the 11th to 40th percentiles. The majority of exceedances, 9, was associated with lower flows (within the 61st to 90th percentiles).

Table 5.2 depicts the allowable coliform bacteria load for peak flow, low flow, and 5-percentile increments in flow. **Table 5.2** was created by taking the Nth percentile flow (flow rank in the table) from the measured flow data and multiplying each percentile flow by the fecal coliform criterion of 400 counts/100mL and converting into bacteria counts/day. This conversion was accomplished by multiplying the criterion by [(28317/100)*60*60*24]. The factor 28317/100 converts counts/100mL into counts per cubic foot.

Finally, the percent reduction in loading needed for compliance with the state criterion was calculated. The actual needed load reduction was calculated using the following equation:

$$(2) \qquad \frac{\text{(existing load) – (allowable load)}}{\text{(existing load)}} \times 100$$

On the load duration curve, all points higher than the allowable load were considered an exceedance of the fecal coliform criterion. A regression analysis was performed to determine the best correlation for the exceedances. The existing loading of a given flow duration interval was calculated using the regression equation displayed in **Figure 5.2**, and a given flow duration interval between the 10th and 90th percentile, in 5-percentile increments. The allowable loading of a given flow duration interval was calculated using Equation 1, within the flow duration interval with 5-percentile increments. Using Equation 2, the load reduction was determined for each flow interval. **Table 5.3** lists the flow duration intervals, allowable loadings, existing loadings, and needed load reductions for fecal coliform bacteria.

5.4 Critical Conditions/Seasonality

The critical conditions for coliform loadings in a given watershed depend on the existence of point sources and land use patterns in the watershed. Typically, the critical condition for nonpoint sources is an extended dry period, followed by a rainfall runoff event. During wet weather periods, coliform bacteria that have built up on the land surface under dry weather conditions are washed off by rainfall, resulting in wet weather exceedances. However, significant nonpoint source contributions can also occur under dry weather conditions without any major surface runoff event. This usually happens when nonpoint sources contaminate the surficial aquifer and coliform bacteria are brought into the receiving waters through baseflow. Livestock with direct access to the receiving water can also contribute to exceedances during dry weather conditions. The critical condition for point source loading typically occurs during periods of low stream flow, when dilution is minimized.

Table 5.2. Coliform Target Loads as a Function of Flow

Flow Ranking (%)	*Cfs*	Allowable Loads	
		Fcoli Load (counts/day)	**Flow Conditions**
	977.0	9.56E+12	**Peak**
	902.0	8.83E+12	
	874.3	8.56E+12	**1-day**
1%	673.8	6.59E+12	
5%	454.8	4.45E+12	
10%	325.0	3.18E+12	
15%	207.0	2.03E+12	
20%	153.0	1.50E+12	
25%	117.0	1.15E+12	
30%	90.0	8.81E+11	
35%	70.0	6.85E+11	
40%	55.0	5.38E+11	
45%	45.0	4.40E+11	
50%	37.0	3.62E+11	
55%	30.0	2.94E+11	
60%	24.0	2.35E+11	
65%	19.0	1.86E+11	
70%	16.0	1.57E+11	
75%	14.0	1.37E+11	
80%	11.0	1.08E+11	
85%	7.8	7.63E+10	
90%	5.9	5.77E+10	
95%	4.0	3.91E+10	
99%	0.9	8.39E+09	
100%	0.2	2.06E+09	***Low***

Table 5.3. Table for Calculating Needed Reduction of Fecal Coliform

Flow Ranking (%)	Existing Load (colonies/day)	Allowable Load (colonies/day)	% Reduction Required
10	4.69E+12	3.18E+12	32.1%
15	3.84E+12	2.03E+12	47.2%
20	3.14E+12	1.50E+12	52.3%
25	2.57E+12	1.15E+12	55.4%
30	2.10E+12	8.81E+11	58.1%
35	1.72E+12	6.85E+11	60.2%
40	1.41E+12	5.38E+11	61.8%
45	1.15E+12	4.40E+11	61.8%
50	9.43E+11	3.62E+11	61.6%
55	7.71E+11	2.94E+11	61.9%
60	6.31E+11	2.35E+11	62.8%
65	5.17E+11	1.86E+11	64.0%
70	4.23E+11	1.57E+11	63.0%
75	3.46E+11	1.37E+11	60.4%
80	2.83E+11	1.08E+11	62.0%
85	2.32E+11	7.63E+10	67.0%
90	1.90E+11	5.77E+10	69.5%
Median	**9.43E+11**	**3.62E+11**	**61.8**%

As shown in **Figure 5.2**, exceedances of fecal coliform bacteria in the Peace Creek Drainage Canal appeared during all flow regimes. In general, exceedances on the right side of the curve typically occur during low-flow events, implying a contribution from either point sources or baseflow. In contrast, exceedances on the left side of the curve usually represent potential sources accumulated on the land surface that could result from the land application of biosolids, wildlife, livestock, and pets. As discussed in Chapter 4, one active permitted facility discharges fecal coliform loads indirectly into the Peace Creek Drainage Canal. Under low-flow conditions, a contribution of fecal coliform bacteria can be attributed to the permitted point source; to baseflow, which could result from leaking septic tanks or sewer lines; or to the improper application of biosolids on the land surface. In the Peace Creek Drainage Canal watershed, **(Figure 5.2)** a lower number of fecal coliform exceedances is associated with higher flow conditions. The majority of exceedances, or 9, was associated with lower flows in the 61st to 90th percentiles.

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 fecal coliform TMDL for the Peace Creek Drainage Canal is expressed in terms of colonies per day for the overall TMDL and as a percent reduction for MS4 areas and other nonpoint sources to meet the applicable criterion. The TMDL represents the maximum daily fecal coliform load the canal can assimilate and maintain the applicable fecal coliform criterion **(Table 6.1).**

Table 6.1. TMDL Components for the Peace Creek Drainage Canal, WBID 1539

Parameter	TMDL (colonies/day)	WLA		LA (percent reduction)	MOS
		Wastewater (colonies/day)	NPDES Stormwater (percent reduction)		
Fecal Coliform	3.62E + 11	Must Meet Permit Limits	62	62	Implicit

6.2 Load Allocation

Based on a load duration curve approach similar to that developed by the state of Kansas (Stiles, 2002), a fecal coliform reduction of 62 percent is needed from nonpoint sources for all flow periods. This percent reduction was derived from the median value of all percent reductions at all flow ranks (10 percent–90 percent), as seen in **Table 5.3**. It should be noted that the LA includes loading from stormwater discharges that are not part of the NPDES stormwater program (see **Appendix B**).

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharge

The city of Winter Haven, WWTP #3 (Wahneta Plant, NPDES No. FL0036048), a 5.0 mgd Type I WWTP, discharges to a 150-acre overland flow system, and the effluent is collected in an open ditch and discharged through D001 into an unnamed tributary of the Peace Creek Drainage Canal. The permit includes effluent discharge limits for fecal coliform bacteria. This facility must meet its permit limits for fecal coliform as stated in its permit specifications. **Section I.A.5** of the permit reads as follows:

> *The arithmetic mean of the monthly fecal coliform values collected during an annual period shall not exceed 200 per 100 mL of reclaimed water sample. The geometric mean of the fecal coliform values for a minimum of 10 samples of reclaimed water, each collected on a separate day during a period of 30 consecutive days (monthly), shall not exceed 200 per 100 mL of sample. No more than 10 percent of the samples collected (the 90th percentile value) during a period of 30 consecutive days shall exceed 400 fecal coliform values per 100 mL of sample. Any one sample shall not exceed 800 fecal coliform values per 100 mL of sample [Subsection 62-600.440(4) (c), 12-24-96].*

6.3.2 NPDES Stormwater Discharges

The WLA for the Polk County and FDOT MS4 permit is to address anthropogenic sources in the watershed to result in a 62 percent reduction of instream fecal coliform concentrations under all flow conditions. It should be noted that any MS4 permittee is only responsible for reducing the 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.

While the LA and WLA for fecal coliform are expressed as the percent reduction needed to attain the applicable Class III criteria, it is the combined reductions from both anthropogenic point and nonpoint sources that will result in the required reduction of instream fecal coliform concentrations. However, it is not the intent of the TMDL to abate natural background conditions.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Department, February 2001), an implicit MOS was used in the development of this TMDL. An implicit MOS was provided by the conservative decisions associated with the analytical assumptions and the development of assimilative capacity, which only focuses on exceedances. 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 implicit MOS is appropriate, as existing loads are based on instream coliform measurements. These measurements include decay processes occurring instream and do not represent the maximum load that can be applied to the land and transported to the stream during a rain event.

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, referred to as the BMAP. This document will be developed over the next year in cooperation with local stakeholders, who will attempt to reach consensus on detailed allocations and on how load reductions will be accomplished. The BMAP will include, among other things:

- Appropriate load reduction allocations among the affected parties,
- 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,
- Confirmed and potential funding mechanisms,
- Any applicable signed agreement(s),
- Local ordinances defining actions to be taken or prohibited,
- Any applicable local water quality standards, permits, or load limitation agreements,
- Milestones for implementation and water quality improvement, and
- Implementation tracking, water quality monitoring, and follow-up measures.

An assessment of progress toward the BMAP milestones will be conducted every five years, and revisions to the plan will be made as appropriate, in cooperation with basin stakeholders.

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Appendices

Appendix A: Summary of Monitoring Results for Fecal Coliform in the Peace Creek Drainage Canal, WBID 1539

Station	Sample Date	Sample Time	Flow (cfs)	Flow Rank	Flow Rank (%)	Fecal Coliform (counts/ 100mL)	Fecal Coliform Load (counts/day)	Remark Code[1]
21FLPOLKP.C. CANAL5	4/15/2003	930	127	23.9%	23.9	9	2.80E+10	
21FLPOLKP.C. CANAL1	4/15/2003	845	127	23.9%	23.9	18	5.59E+10	
21FLTPA 25020039	8/19/2003	925	322	10.2%	10.2	20	1.58E+11	
21FLTPA 25020039	11/4/2003	1120	24	60.8%	60.8	20	1.17E+10	
21FLPOLKP.C. CANAL8	5/14/1998	815	33	52.9%	52.9	36	2.91E+10	
21FLPOLKP.C. CANAL8	2/11/1998	830	153	20.1%	20.1	40	1.50E+11	
21FLSWFDFLO0075	3/18/1993	900	457	5.0%	5	40	4.47E+11	Q
21FLA 25020039	10/5/1994	1325	614	1.7%	1.7	60	9.01E+11	J
21FLPOLKP.C. CANAL8	5/20/1997	845	12	78.8%	78.8	60	1.76E+10	
21FLPOLKP.C. CANAL8	4/15/2004	1015	27	58.0%	58	60	3.96E+10	
21FLA 25020039	7/28/1997	1130	97	28.6%	28.6	68	1.61E+11	J
21FLPOLKP.C. CANAL8	8/12/1997	1015	350	9.1%	9.1	70	5.99E+11	
21FLA 25020039	5/4/1994	1335	13	77.1%	77.1	72	2.29E+10	J
21FLA 25020039	5/3/1995	1330	16	71.4%	71.4	80	3.13E+10	J
21FLA 25020039	4/3/1996	1305	274	11.8%	11.8	80	5.36E+11	J
21FLTPA 25020039	3/10/1998	1225	562	2.5%	2.5	80	1.10E+12	
21FLTPA 25020039	5/7/2003	1040	30	55.2%	55.2	80	5.87E+10	K
21FLPOLKP.C. CANAL8	5/21/1996	1015	8.4	83.7%	83.7	84	1.73E+10	
21FLA 25020039	1/25/1994	1415	30	55.2%	55.2	90	6.61E+10	J
21FLPOLKP.C. CANAL8	4/16/2003	950	123	24.3%	24.3	90	2.71E+11	
21FLA 25020039	7/9/1996	1415	302	10.8%	10.8	100	7.39E+11	J
21FLPOLKP.C. CANAL8	8/14/1996	855	244	13.0%	13	100	5.97E+11	
21FLPOLKP.C. CANAL8	2/12/1997	850	14	75.2%	75.2	100	3.43E+10	
21FLTPA 25020039	2/5/2003	1025	95	29.0%	29	100	2.32E+11	K
21FLA 25020039	7/13/1994	1245	70	35.1%	35.1	104	1.78E+11	
21FLA 25020039	6/2/1993	1320	19	66.3%	66.3	140	6.51E+10	J
21FLA 25020039	2/11/1997	1220	14	75.2%	75.2	140	4.80E+10	J
21FLPOLKP.C. CANAL8	4/17/2002	1115	4.6	94.2%	94.2	148	1.67E+10	
21FLPOLKP.C. CANAL8	1/28/2003	1030	150	20.4%	20.4	184	6.75E+11	
21FLPOLKP.C. CANAL1	4/14/2004	830	128	23.8%	23.8	200	6.26E+11	
21FLPOLKP.C. CANAL8	2/6/1996	1052	30	55.2%	55.2	200	1.47E+11	
21FLPOLKP.C. CANAL8	11/20/1996	1012	16	71.4%	71.4	210	8.22E+10	
21FLPOLKP.C. CANAL8	7/24/2002	945	104	27.3%	27.3	220	5.60E+11	
21FLPOLKP.C. CANAL8	7/23/2003	930	231	13.6%	13.6	220	1.24E+12	
21FLPOLKP.C. CANAL5	7/22/2003	915	257	12.4%	12.4	230	1.45E+12	

Station	Sample Date	Sample Time	Flow (cfs)	Flow Rank	Flow Rank (%)	Fecal Coliform (counts/ 100mL)	Fecal Coliform Load (counts/day)	Remark Code[1]
21FLPOLKP.C. CANAL8	1/7/2004	1000	18	67.6%	67.6	230	1.01E+11	
21FLPOLKP.C. CANAL5	4/16/2002	910	93	29.4%	29.4	240	5.46E+11	
21FLPOLKP.C. CANAL8	11/6/1997	855	5.2	92.6%	92.6	240	3.05E+10	
21FLPOLKP.C. CANAL5	4/14/2004	940	75	33.8%	33.8	260	4.77E+11	
21FLPOLKP.C. CANAL8	11/20/1995	1050	30	55.2%	55.2	260	1.91E+11	
21FLA 25020039	8/3/1993	1400	94	29.2%	29.2	280	6.44E+11	J
21FLA 25020039	1/25/1995	1300	68	35.8%	35.8	280	4.66E+11	
21FLA 25020039	1/9/1996	955	366	8.5%	8.5	300	2.69E+12	J
21FLPOLKP.C. CANAL8	10/8/2003	950	60	38.4%	38.4	330	4.84E+11	
21FLPOLKP.C. CANAL5	1/27/2003	915	163	18.9%	18.9	340	1.36E+12	
21FLPOLKP.C. CANAL5	10/7/2003	940	61	38.2%	38.2	350	5.22E+11	
21FLA 25020039	11/3/1993	1325	62	37.9%	37.9	370	5.61E+11	
21FLA 25020039	2/16/1993	1230	58	39.1%	39.1	400	5.68E+11	J
21FLPOLKP.C. CANAL1	10/7/2003	820	61	38.2%	38.2	460	6.87E+11	
21FLSWFDFLO0075	6/9/1993	830	8.2	84.2%	84.2	500	1.00E+11	Q
21FLPOLKP.C. CANAL8	10/23/2002	950	12	78.8%	78.8	530	1.56E+11	
21FLSWFDFLO0075	12/7/1992	0	49	43.3%	43.3	550	6.59E+11	Q
21FLA 25020039	7/12/1995	1335	27	58.0%	58	555	3.67E+11	
21FLPOLKP.C. CANAL5	1/6/2004	900	19	66.3%	66.3	570	2.65E+11	
21FLPOLKP.C. CANAL1	7/22/2003	800	257	12.4%	12.4	590	3.71E+12	
21FLPOLKP.C. CANAL5	10/22/2002	845	12	78.8%	78.8	706	2.07E+11	B
21FLPOLKP.C. CANAL5	7/23/2002	845	118	24.9%	24.9	714	2.06E+12	B
21FLA 25020039	10/4/1995	1205	354	9.0%	9	720	6.24E+12	
21FLSWFDFLO0075	8/24/1993	1145	15	73.2%	73.2	770	2.83E+11	Q
21FLA 25020039	6/2/1997	1300	12	78.8%	78.8	1,200	3.52E+11	L
21FLPOLKP.C. CANAL1	1/6/2004	755	19	66.3%	66.3	3,400	1.58E+12	
21FLPOLKP.C. CANAL5	1/15/2002	900	23	61.9%	61.9	5,700	3.21E+12	
21FLPOLKP.C. CANAL8	1/15/2002	1000	23	61.9%	61.9	5,800	3.26E+12	E

Note: Flow and concentration data analyzed for the TMDL were from December 1992 through April 2004. The Group 3 verification period is from January 1, 1997, through June 30, 2004. Flow data were from USGS Gage 02293987, located in WBID 1539.

[1] Remark Code: *J – Estimated value.*
Q – Sample held beyond normal holding time.
B – Results based on colony counts outside the acceptable range.
E – Extra sample taken at composite stations.
K – Actual value not known, but known to be less than value shown.
L – Actual value is known to be greater than value given.

Appendix B: 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 Chapter 62-40, F.A.C.

The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a 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 implementation of 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 NPDES and other state stormwater permitting programs is that the NPDES Program covers both new and existing discharges, while the other state programs focus on new discharges. 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.

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