FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Environmental Assessment and Restoration,
Bureau of Watershed Restoration

SOUTHWEST DISTRICT • TAMPA BAY TRIBUTARIES BASIN

TMDL Report

Fecal Coliform TMDL for Mustang Ranch Creek (1592C), Turkey Creek (1578B), English Creek (1552), and Poley Creek (1583)

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Acknowledgments

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

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Web sites

Florida Department of Environmental Protection, Bureau of Watershed Restoration

TMDL Program

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

Identification of Impaired Surface Waters Rule

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

STORET Program

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

2008 Integrated Report

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

Criteria for Surface Water Quality Classifications

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

Basin Status Report for the Tampa Bay Tributaries Basin

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

Basin Water Quality Assessment Report for the Tampa Bay Tributaries Basin

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

U.S. Environmental Protection Agency

Region 4: Total Maximum Daily Loads in Florida

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

National STORET Program

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 Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583). These waterbodies were verified as impaired for fecal coliform and therefore were included on the Verified List of impaired waters for the Tampa Bay Tributaries Basin that was adopted by Secretarial Order on June 3, 2008. The TMDL establishes the allowable fecal coliform loadings to Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583), that would restore the waterbody, so that it meets its applicable water quality criterion for fecal coliform.

1.2 Identification of Waterbody

Mustang Ranch Creek and Turkey Creek, is located in the central west portion of Hillsborough County and are not connected by land mass but they both empty into the Alafia River. A portion of English Creek is located within the west portion of Hillsborough County and the other portion in East Polk County. Poley creek is located in East Polk County. Three of the waterbodies are connected and separated by waterbody lines; Mustang Ranch Creek; English Creek and Poley Creek. All four waterbodies are in the vicinity of Southwest Tampa Bay (**Figure 1.1**). They are part of the Tampa Bay Tributaries and are hydrologically connected as tributaries to the Alafia River and eventually emptying out into Tampa bay. There are two Cities north of these Waterbodies, Plant City north of Turkey Creek watershed and Lakeland North of Poley Creek watershed. Interstate 4 (I-4) runs north of the waterbodies passing through both cities. Additional information about the river's hydrology and geology are available in the Basin Status Report for the Tampa Bay Tributaries Basin (Florida Department of Environmental Protection [Department], 2001).

For assessment purposes, the Department has divided the Tampa Bay Tributaries Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach: Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583). (**Figure 1.2**).

1.3 Background

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

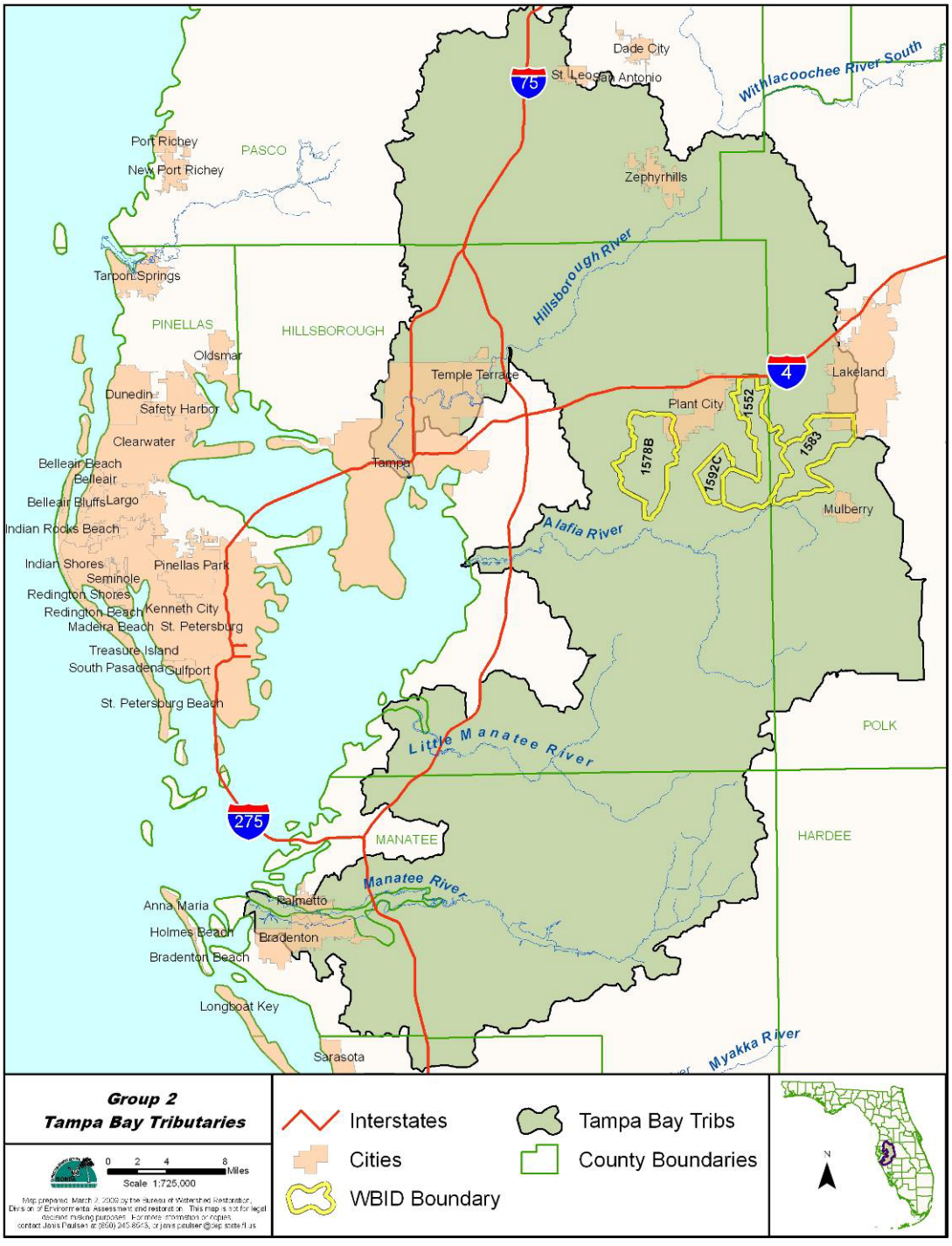


Figure 1.1. Location of Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552) and Poley Creek (WBID 1583) in Hillsborough and Polk County and Major Geopolitical Features in the Area

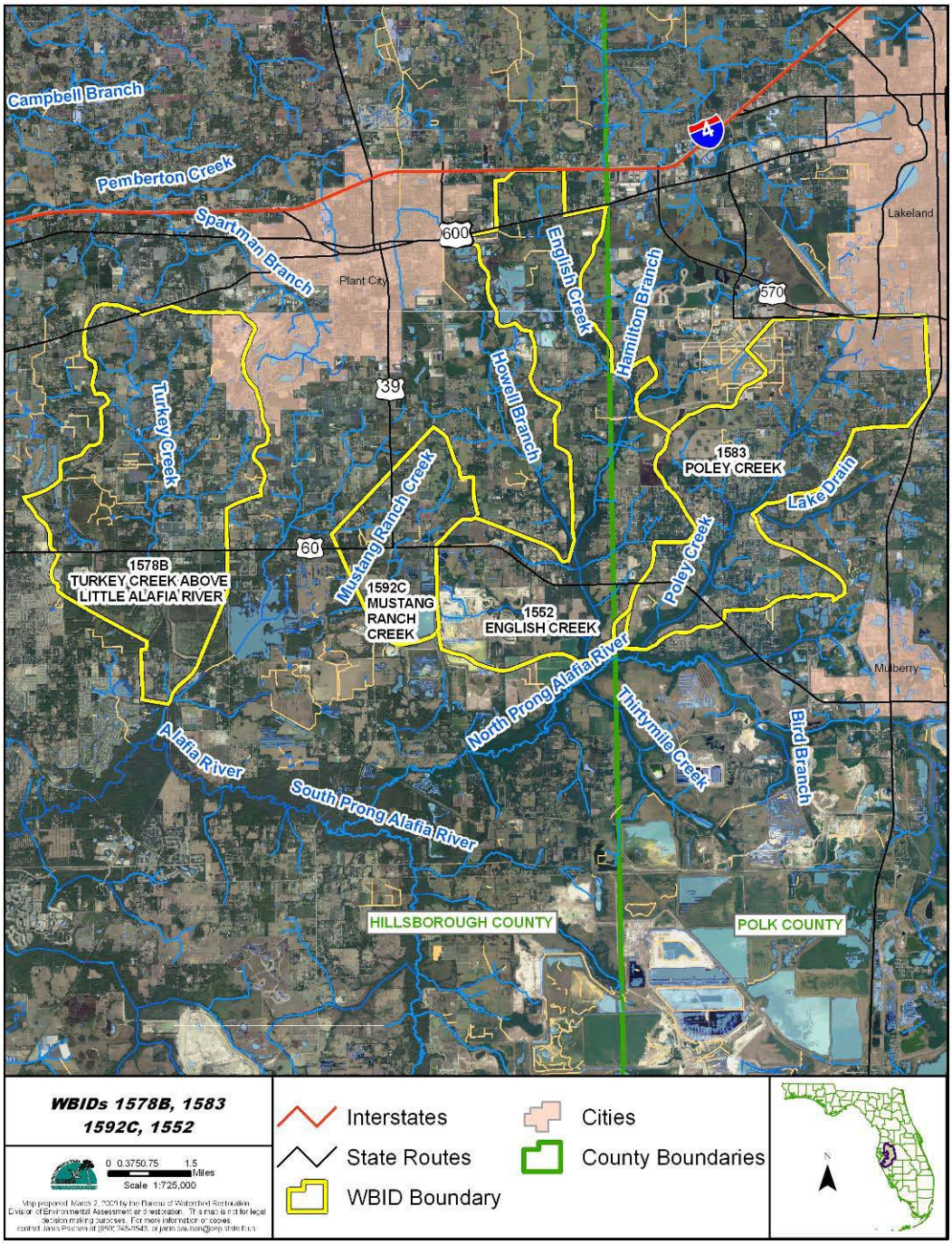


Figure 1.2. Location of Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552) and Poley Creek (WBID 1583)

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 may be followed by the development and implementation of a restoration plan, designed to reduce the amount of fecal coliform that caused the verified impairment of: Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583). These activities will depend heavily on the active participation of the Southwest Florida Water Management District (SWFWMD), Hillsborough County's Environmental Protection Commission (HEPC), local governments, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

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

Florida's 1998 303(d) list included 10 waterbodies in the Alafia River Basin. However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rulemaking process, the Environmental Regulation Commission adopted the new methodology as Rule 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001; the rule was modified in 2004 and 2007.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) watersheds and verified the impairments during the second cyle of the TMDL program (**Table 2.1**). These waterbodies are spatially and hydrologically connected, thus we are including all four WBIDs in this report to address the fecal coliform impairments. **Table 2.2** summarizes the fecal coliform data collected during the verification period (January 1, 2001, through June 30, 2008). The projected year for the (1998 303(d) listed) fecal coliform bacteria TMDL for Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) was 2008, but the Settlement Agreement between EPA and Earthjustice, which drives the TMDL development schedule for waters on the 1998 303(d) list, allows an additional nine months to complete the TMDLs. As such, these TMDLs must be adopted and submitted to EPA by September 30, 2009.

These waterbodies were verified as impaired based on fecal coliform because, using the IWR methodology, more than 10 percent of the values exceeded the Class II freshwater criterion of 400 counts per 100 milliliters (counts/100mL) for fecal coliform: Mustang Ranch Creek (6 out of 6 samples); Turkey Creek Above Little Alafia River, (79 out of 141 samples); English Creek (22 out of 72 samples) and Poley Creek (19 out of 39 samples). These were the exceedances during the verified period above the criterion of 400 counts/100mL. The fecal coliform data used in this report is based on the IWR Run-35 database.

The verified impairments were based on data collected by Hillsborough County and the Southwest District, WBID location and STORET stations are shown in **Figure 5.1**. **Figures 2.1A(B,C,D)** displays the fecal coliform data collected from 2001 through 2008 for each watershed.

Table 2.1. Verified Impairments for Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552) and Poley Creek (WBID 1583)

WBID	Waterbody Segment	Waterbody Type	Waterbody Class	1998 303(d) Parameters of Concern	Parameter Causing Impairment For present TMDL
1592C	Mustang Ranch Creek	stream	3F	Coliforms	Fecal Coliform
1578B	Turkey Creek	stream	3F	Coliforms	Fecal Coliform
1552	English Creek	stream	3F	Coliforms	Fecal Coliform
1583	Poley Creek	stream	3F	Coliforms	Fecal Coliform

**Note – WBID Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583).was included on the 1998 303(d) List for Fecal Coliforms with a TMDL priority of Low and due date of 2008.

Table 2.2. Summary of Fecal Coliform Data for Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552) and Poley Creek (WBID 1583) (January 1, 2001 – June 30, 2008)

WBID	Total Number of Samples	IWR-required number of exceedances for the Verified List	Number of observed exceedances	Number of observed nonexceedances	Number of seasons data was collected	Mean	Median	Min	Max
1592C	6	5	6	0	4	4393	3947	450	13,600
1578B	141	20	79	62	4	1239	600	20	20,000
1552	72	12	22	50	4	557	240	20	10,200
1583	39	7	19	20	4	947	400	27	3600

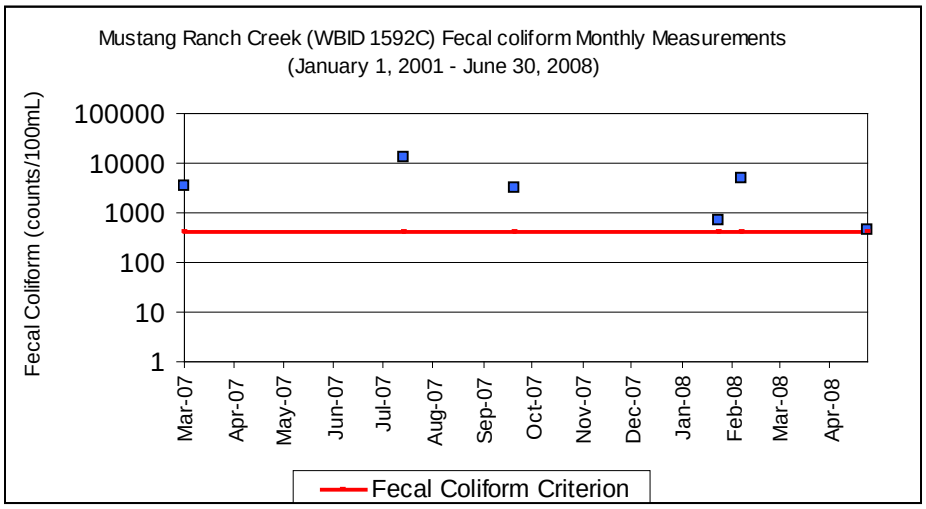


Figure 2.1A. Fecal Coliform Measurements for the Mustang Ranch Creek (WBID 1592C, January 1, 2001 – June 30, 2008)

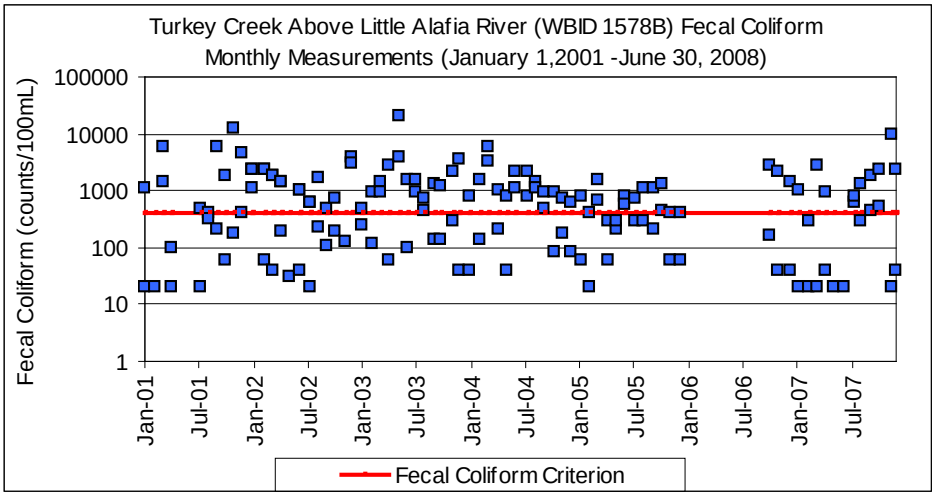


Figure 2.1B. Fecal Coliform Measurements for the Turkey Creek, Above Little Alafia River (WBID 1578B January 2001 – June 30, 2008)

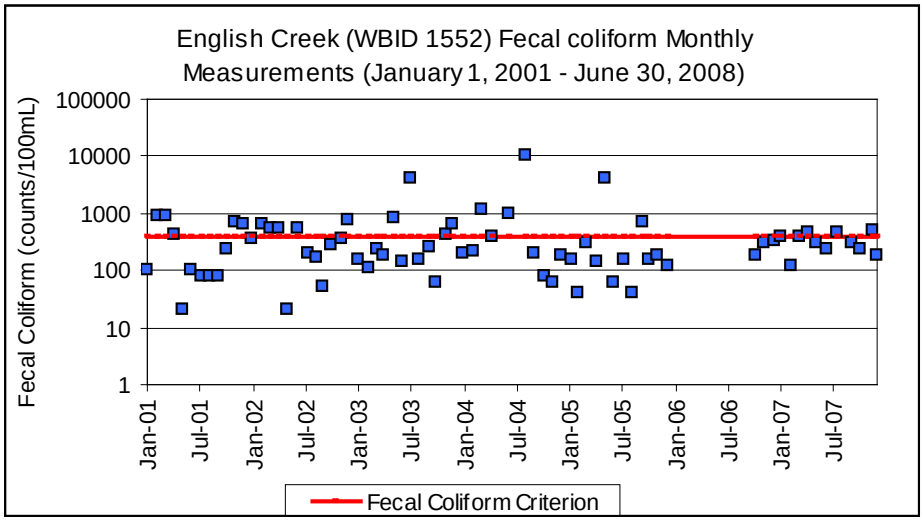


Figure 2.1C. Fecal Coliform Measurements for the English Creek, WBID 1552 (January 1, 2001 – June 2008)

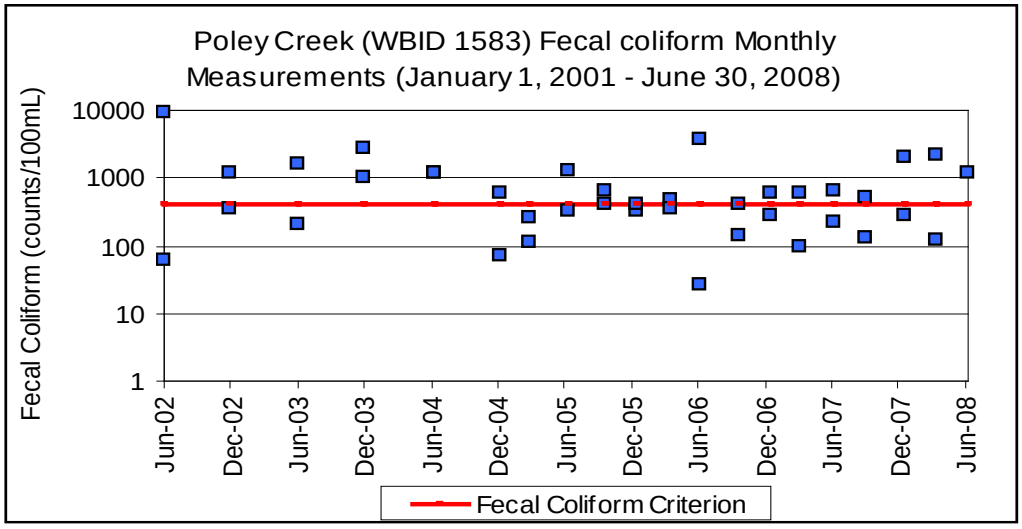


Figure 2.1D. Fecal Coliform Measurements for the Poley Creek, WBID 1583 (January 1, 2001 – June 30, 2008)

Chapter 3. DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criteria Applicable to the TMDL

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

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

Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) are Class III waterbodies, with a designated use of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife. The criterion applicable to this TMDL is the Class III criterion for fecal coliform.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

Numeric criteria for bacterial quality are expressed in terms of fecal coliform bacteria concentration. 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.*

The criterion states state that monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. During the development of the TMDLs (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 TMDLs were not to exceed 400 MPN/100mL in any sampling event for fecal coliform. The 10 percent exceedance allowed by the water quality criterion for fecal coliform bacteria was not used directly in estimating the target load, but was included in the TMDLs margin of safety (as described in subsequent chapters).

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

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

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

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

4.2 Potential Sources of Fecal Coliform in Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek Watersheds

4.2.1 Point Sources

There is one permitted facility discharging Fecal coliform into an unnamed ditch that flows to Turkey Creek (WBID 1578B): The facility permit number is: FL0040983 (Valrico Advance Waste Water Treatment Facility (AWWTF)). The discharge Location is approximately 27 57' 30" latitude north and 82 12' 30" longitude west.The existing system is a 3.0 mgd annual average daily flow (AADF) outfall. There is a land application reuse system of 2.0 mgd daily flow, covering an area of 263 acres, located at the Advance Waste Water Treatment Facility. There are no NPDES permitted facilities discharging fecal coliform bacteria directly to surface water in Mustang Ranch Creek (WBID 1592C), English Creek (WBID 1552), and Poley Creek (WBID 1583).

Municipal Separate Storm Sewer System Permittees

The stormwater collection systems owned and operated by Hillsborough County and Co-Permittees (FDOT District 7 & Florida's Turnpike Enterprise, and City of Plant City) are covered by a Phase I NPDES municipal separate storm sewer system (MS4) permit (FLS000006) and the stormwater collection systems owned and operated by Polk County and Co- Permittees (FDOT District 1 / Florida's Turnpike) are covered by a Phase I NPDES municipal separate storm sewer system (MS4) permit (FLS000015). There are no Phase II MS4 permits identified for Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583).

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 our 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. **Table 4.6** provides estimated fecal coliform loadings from dogs, septic tanks, and sanitary sewer overflows for the Mustang Ranch Creek, Turkey Creek, English Creek, and Poley Creek watersheds.

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.

Agriculture 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. Agriculture land occupies 53%, 34%, 34%, and 15% of the total land area in Mustang Ranch Creek, Turkey Creek, English Creek, and Poley Creek, respectively. Livestock data from the

2002 *Agricultural Census Report* for Hillsborough County are listed in **Tables 4.1A(B)** (U.S. Department of Agriculture, 2002).

Table 4.1A. Livestock Distribution for Hillsborough County

Livestock Distribution	Hillsborough County (number of livestock)
Cattle/Calves	65,501
Milk cows	4,408
Beef cows	33,144
Hogs/Pigs	1,724
Poultry layers > 20 weeks	(D)
Poultry broilers	428
Sheep/Lambs	793
Horses and Ponies	4,975

(D) – Data withheld to avoid disclosing data for individual farms.
Source: U.S. Department of Agriculture. 2002. *Agricultural Census Report*.

Table 4.1B. Livestock Distribution for Polk County

Livestock Distribution	Polk County (number of livestock)
Cattle/Calves	108,126
Milk cows	(D)
Beef cows	ND
Hogs/Pigs	1,724
Poultry layers > 20 weeks	(D)
Poultry broilers	ND
Sheep/Lambs	1,254
Horses and Ponies	2,562

(D) – Data withheld to avoid disclosing data for individual farms.
(ND) –No data
Source: U.S. Department of Agriculture. 2002. *Agricultural Census Report*.

Land Uses

The spatial distribution and acreage of different land use categories were identified using the SWFWMD's 2006 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 and tabulated in **Tables 4.2A(B,C,D)**. **Figure 4.1** shows the acreage of the principal land uses in each of the watersheds.

As shown in **Tables 4.2A(B,C,D),** the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds drain about 3,629; 12,213; 12,527; and 10,466 acres of land, respectively. The dominant land use category for Turkey Creek, English Creek and Poley Creek is urban land (urban and built-up; low-, medium-, and high-density residential; and transportation, communication, and utilities), which accounts for approximately 50%, 40%, and 60%, of these watersheds' total area. The dominant land use categories for Mustang Ranch Creek are agriculture (53%) and urban land (33%).

Table 4.2A. Classification of Land Use Categories for Mustang Ranch Creek Watershed, WBID 1592C

Level 1 Code	Landuse	Acreage	% Acreage
1000	Urban and Built-Up	640	17.64
1100	Low-residential density	517	14.25
1200	Medium-residential density	19	0.52
1300	High-residential density	0	0.00
2000	Agriculture	1938	53.40
3000	Rangeland	11	0.30
4000	Forest/rural open	169	4.66
5000	Water	70	1.93
6000	Wetlands	192	5.29
7000	Barrenland	13	0.36
8000	Transportation, Communication, & Utilities	60	1.65
	Total	3629	100.00

Table 4.2B. Classification of Land Use Categories for Turkey Creek Watershed, WBID 1578B

Level 1 Code	Landuse	Acreage	% Acreage
1000	Urban and Built-Up	3731	30.55
1100	Low-residential density	2063	16.89
1200	Medium-residential density	629	5.15
1300	High-residential density	122	1.00
2000	Agriculture	4124	33.77
3000	Rangeland	44	0.36
4000	Forest/rural open	355	2.91
5000	Water	138	1.13
6000	Wetlands	758	6.21
7000	Barrenland	98	0.80
8000	Transportation, Communication, & Utilities	151	1.24
	Total	**12213**	**100.00**

Table 4.2C. Classification of Land Use Categories for English Creek Watershed, WBID 1552

Level 1 Code	Landuse	Acreage	% Acreage
1000	Urban and Built-Up	2195	17.52
1100	Low-residential density	2105	16.80
1200	Medium-residential density	431	3.44
1300	High-residential density	33	0.26
2000	Agriculture	4261	34.01
3000	Rangeland	283	2.26
4000	Forest/rural open	1311	10.47
5000	Water	277	2.21
6000	Wetlands	1468	11.72
7000	Barrenland	25	0.20
8000	Transportation, Communication, & Utilities	138	1.10
	Total	12527	100.00

Table 4.2D. Classification of Land Use Categories for Poley Creek Watershed, WBID 1583

Level 1 Code	Landuse	Acreage	% Acreage
1000	Urban and Built-Up	1443	13.79
1100	Low-residential density	1332	12.73
1200	Medium-residential density	3327	31.79
1300	High-residential density	532	5.08
2000	Agriculture	1550	14.81
3000	Rangeland	88	0.84
4000	Forest/rural open	394	3.76
5000	Water	187	1.79
6000	Wetlands	1235	11.80
7000	Barrenland	14	0.13
8000	Transportation, Communication, & Utilities	364	3.48
	Total	10466	100.00

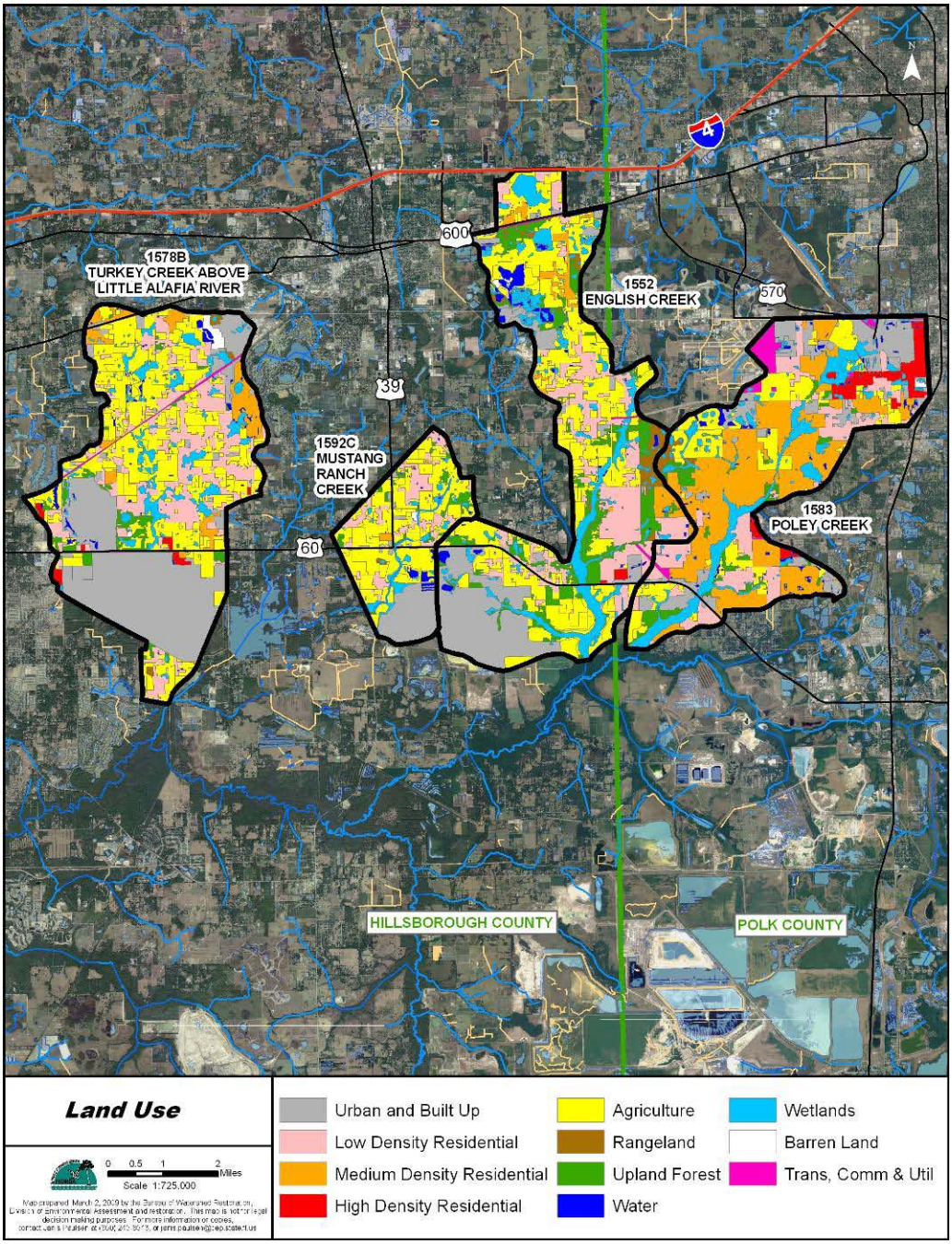


Figure 4.1. Principal Land Uses in Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552) and Poley Creek (WBID 1583)

Urban Development

Pets (especially dogs) could be a significant source of coliform pollution through surface runoff in the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds. In addition to pets, other animal fecal coliform contributors commonly seen in urban areas include rats, pigeons, and sometimes raccoons.

Studies report that up to 95 percent of the fecal coliform found in urban stormwater can come from nonhuman origins (Alderiso et al., 1996; Trial et al., 1993). The most important nonhuman fecal coliform contributors appear to be dogs and cats. In a highly urbanized Baltimore catchment, Lim and Olivieri (1982) found that dog feces were the single greatest source for fecal coliform and fecal streptococcus bacteria. Trial et al. (1993) also reported that cats and dogs were the primary source of fecal coliform in urban watersheds. Using bacteria source tracking techniques, Watson (2002) found that the amount of fecal coliform bacteria contributed by dogs in Stevenson Creek in Clearwater, Florida, was as important as that from septic tanks.

According to the American Pet Products Manufacturers Association (APPMA), about 4 out of 10 U.S. households include at least one dog. A single gram of dog feces contains about 23 million fecal coliform bacteria (Van der Wel, 1995). Unfortunately, statistics show that about 40 percent of American dog owners do not pick up their dogs' feces.

Table 4.3 shows the fecal coliform concentrations of surface runoff measured in two urban areas (Bannerman et al., 1993; Steuer et al., 1997). While bacteria levels were widely different in the two studies, both indicated that residential lawns, driveways, and streets were the major source areas for bacteria.

Table 4.3. Concentrations (Geometric Mean Colonies per 100 mL) of Fecal Coliform from Urban Source Areas (Steuer et al., 1997; Bannerman et al., 1993)

Geographic Location	Marquette, MI	Madison, WI
Number of storms sampled	12	9
Commercial parking lot	4,200	1,758
High-traffic street	1,900	9,627
Medium-traffic street	2,400	56,554
Low-traffic street	280	92,061
Commercial rooftop	30	1,117
Residential rooftop	2,200	294
Residential driveway	1,900	34,294
Residential lawns	4,700	42,093
Basin outlet	10,200	175,106

The number of dogs in the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek, watersheds is not known. Therefore, this analysis used the statistics produced by APPMA to estimate the possible fecal coliform loads contributed by dogs. The human populations in the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds calculated from the census track using Tiger Track 2000 data (the Department's

GIS library) were approximately 11,500 for Mustang Ranch Creek, 8553 for Turkey Creek, 33,118 for English Creek and 33,329 for Poley Creek located in Polk County. According to the U.S. Census Bureau, there were 2.50 persons per household in Hillsborough County in 2007 and 2.60 persons per household in Polk County in 2007. This results in an estimated 4,600 for Mustang Ranch Creek, 3,421 for Turkey Creek, 13,247 for English Creek and 12,818 for Poley Creeks' respective, watersheds. Assuming that 40 percent of the households in this area have 1 dog, the total number of dogs in the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds is about 1,840, 1,368, 5,298 and 5127, respectively.

According to the waste production rate for dogs and the fecal coliform counts per gram of dog wastes listed in **Table 4.4**, and assuming that 40 percent of dog owners do not pick up dog feces, the total waste produced by dogs and left on the land surface of residential areas would be 577,080 grams/day. The total fecal coliform produced by dogs for Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds would be 7.29×10^{11} counts/day, 5.42×10^{11} counts/day, and 2.10×10^{12} counts/day and 2.03×10^{12} Counts/day of fecal coliform, respectively.

It should be noted that this load only represents the estimated fecal coliform load created in the watershed and is not intended to be used to represent a part of the existing load that reaches the receiving waterbody. The fecal coliform load that eventually reaches the receiving waterbody could be significantly less than this value due to attenuation in overland transport.

Table 4.4. Dog Population Density, Wasteload, and Fecal Coliform Density

Type	Population density (an/household)	Waste load (g/an-day)	Fecal coliform density (fecal coliform/g)
Dog	0.4*	450	2,200,000

* Number from APPMA.
Source: Weiskel et al., 1996.

Septic Tanks

Septic tanks are another potentially important source of coliform pollution in urban watersheds. When properly installed, most of the coliform from septic tanks should be removed within 50 meters of the drainage field (Minnesota Pollution Control Agency, 1999). However, in areas with a relatively high ground water table, the drainage field can be flooded during the rainy season, and coliform bacteria can pollute the surface water through storm runoff. Septic tanks may also cause coliform pollution when they are built too close to irrigation wells. Any well that is installed in the surficial aquifer system will cause a drawdown. If the septic tank system is built too close to the well (e.g., less than 75 feet), the septic tank discharge will be within the cone of influence of the well. As a result, septic tank effluent may go into the well and once the polluted water is used to irrigate lawns, coliform bacteria may reach the land surface and wash into surface waters during rainy periods.

A rough estimate of fecal coliform loads from failed septic tanks in each watershed can be made using **Equation 4.1**:

$$L = 37.85 * N * Q * C * F \qquad \textbf{Equation 4.1}$$

Where,

L is the fecal coliform daily load (counts/day);
N is the total number of septic tanks in the watershed (septic tanks);
Q is the discharge rate for each septic tank;
C is the fecal coliform concentration for the septic tank discharge, and
F is the septic tank failure rate.

Based on 2007 Florida Department of Health (FDOH) onsite sewage GIS coverage (http://www.doh.state.fl.us/environment/programs/EhGis/EhGisDownload.htm), about 131; 596; 701; and 1,724 housing units (*N*) were identified as being on septic tanks in the Mustang Ranch Creek, Turkey Creek , English Creek and the Poley Creek watersheds, respectively (**Figure 4.2**). The discharge rate from each septic tank (*Q*) was calculated by multiplying the average household size by the per capita wastewater production rate per day. Based on the information published by the U.S. Census Bureau, the average household size for Hillsborough County is about 2.50 people/household and the average household size for Polk County is about 2.60 people per household. A commonly cited value for per capita wastewater production rate is 70 gallons/day/person (EPA, 2001). The commonly cited concentration (*C*) for septic tank discharge is $1x10^6$ counts/100mL for fecal coliform (EPA, 2001).

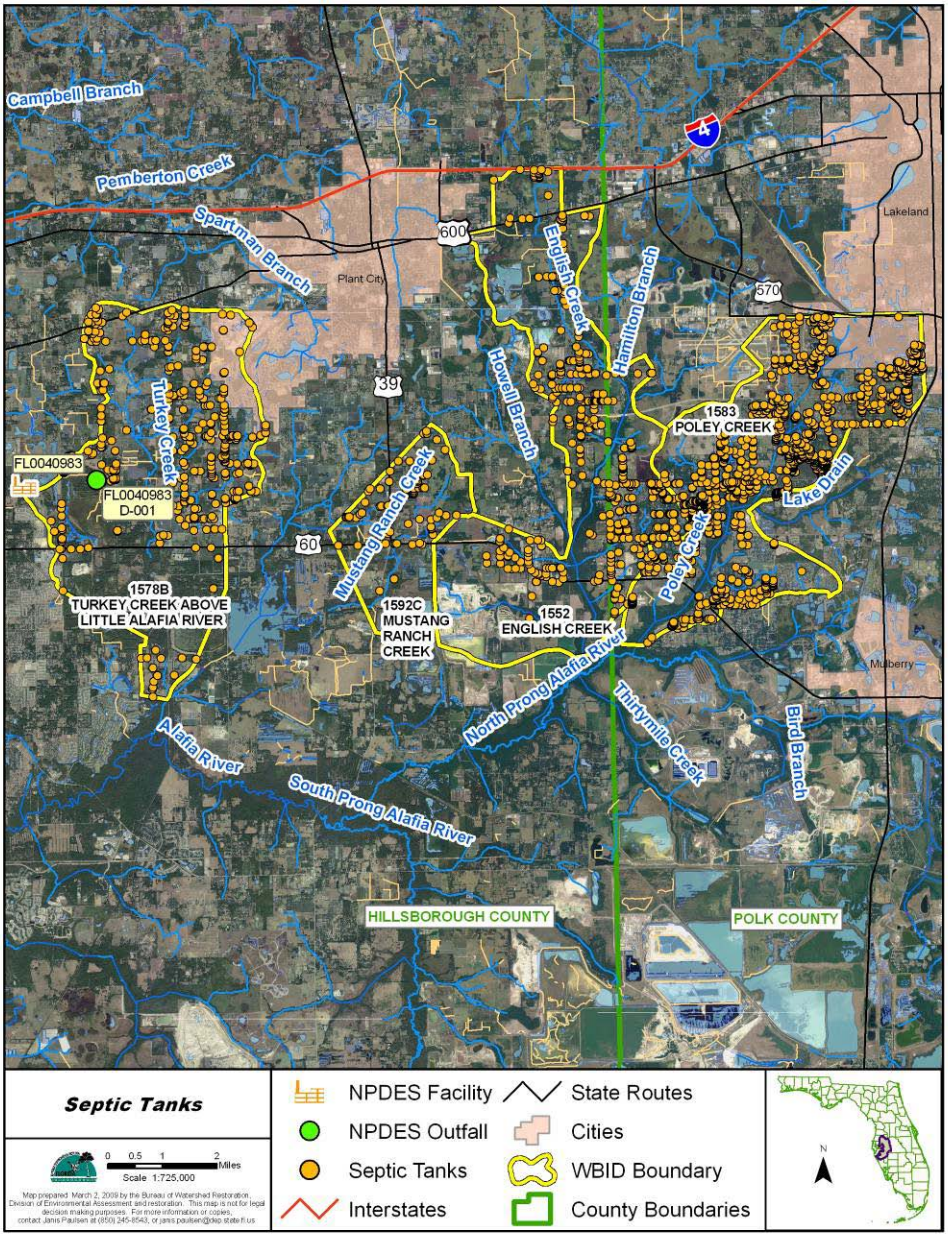


Figure 4.2. Distribution of Onsite Sewage Systems (Septic Tanks) in Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek Watersheds.

No measured septic tank failure rate data were available for the watershed at the time this TMDL analysis was conducted. Therefore the failure rate was derived from the number of septic tank and septic tank repair permits for the county published by FDOH (http://www.doh.state.fl.us/environment/OSTDS/statistics/ostdsstatistics.htm). The number of septic tanks in the county was calculated assuming that none of the installed septic tanks will be removed after being installed. The reported number of septic tank repair permits was also obtained from the FDOH website.

Based on this information, a discovery rate of failed septic tanks for each year between 2002 and 2007 was calculated and listed in **Table 4.5A(B)**. Using the table, the average annual septic tank failure discovery rate for Hilllsborough County is about 0.81 percent and 1.19 percent for Polk County. Assuming that failed septic tanks are not discovered for about 5 years, the estimated annual septic tank failure rate is about 5 times the discovery rate, or 4.1 percent for Hillsborough County and 6.0 percent for Polk County. Based on **Equation 4.1**, the estimated fecal coliform loadings from failed septic tanks in the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds would be 2.66×10^{10} counts/day, 1.21×10^{11} counts/day, 1.42×10^{11} counts/day, and 3.50×10^{11} counts/day of fecal coliform, respectively.

Table 4.5.A Estimated Septic Numbers and Septic Failure Rates for Hillsborough County, 2002–07

	2002	2003	2004	2005	2006	2007	Average
New installation (septic tanks)	986	1031	1005	1314	1236	487	1010
Accumulated installation (septic tanks)	99483	100469	101500	102505	103819	105055	102139
Repair permit (septic tanks)	998	929	735	815	751	754	830
Failure discovery rate (%)	1.00	0.92	0.72	0.80	0.72	0.72	0.81
Failure rate (%)*	5.0	4.6	3.6	4.0	3.6	3.6	4.1

* The failure rate is 5 times the failure discovery rate.

Table 4.5.B Estimated Septic Numbers and Septic Failure Rates for Polk County, 2002–07

	2002	2003	2004	2005	2006	2007	Average
New installation (septic tanks)	1252	1396	1333	1657	1234	675	1258
Accumulated installation (septic tanks)	98995	100247	101643	102976	104633	105867	102394
Repair permit (septic tanks)	1439	1299	1238	1142	1112	1062	1215
Failure discovery rate (%)	1.45	1.30	1.22	1.11	1.06	1.00	1.19
Failure rate (%)*	7.3	6.5	6.1	5.5	5.3	5.0	6.0

*Failure rate is 5 times the failure discovery rate.

Sanitary Sewer Overflows

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

Fecal coliform loading from sewer line leakage can be calculated, based on the number of people in the watershed, typical per household generation rates, and the typical fecal coliform concentration in domestic sewage, assuming a leakage rate of 0.5 percent (Culver et al., 2002). Based on this assumption, a rough estimate of fecal coliform loads from leaks and overflows of sanitary sewer in the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds can be made using **Equation 4.2**:

$$L = 37.85 * N * Q * C * F \qquad \textbf{Equation 4.2}$$

Where,

L is the fecal coliform daily load (counts/day);
N is the number of households using sanitary sewer in the watershed;
Q is the discharge rate for each household;
C is the fecal coliform concentration for the domestic wastewater discharge, and
F is the sewer line leakage rate.

The number of households (*N*) in Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds that use sewer lines are 1709; 12,825;12,546; and 11,094, (total households minus septic tank households), respectively. The discharge rate through the sewer line from each household (*Q*) was calculated by multiplying the average household size (2.50 and 2.60 people) by the per capita wastewater production rate per day (70 gallons). The commonly cited concentration (*C*) for domestic wastewater is $1x10^6$ counts/100mL for fecal coliform (EPA, 2001). Of the total number of households using the sewer line, 0.5 percent (*F*) was assumed as the sewer line leakage rate (Culver et al., 2002). Based on **Equation 4.2**, the estimated fecal coliform loading from sewer line leakage in the Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek watersheds are about 1.30×10^{11} counts/day, 8.20×10^{10} counts/day, 3.64×10^{11} counts/day, and 3.22×10^{11} counts/day, respectively.

Table 4.6. Estimate fecal coliform loadings from Dogs, Septic Tanks, and SSO's in the Mustang Ranch Creek, Turkey Creek, English Creek, and Poley Creek watersheds

Waterbody	Dogs (counts/day)	Septic Tanks (counts/day)	SSO's (counts/day)
Mustang Ranch Creek	7.29×10^{11}	2.66×10^{10}	1.30×10^{11}
Turkey Creek	5.42×10^{11}	1.21×10^{11}	8.20×10^{10}
English Creek	2.10×10^{12}	1.42×10^{11}	3.64×10^{11}
Poley Creek	2.03×10^{12}	3.50×10^{11}	3.22×10^{11}

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

The fecal coliform TMDL calculation was developed using the "percent reduction" approach. For this method, the percent reduction needed to meet the applicable criterion 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

Data used for this TMDL report were provided by Hillsborough and Polk County Stations and the DEP Southwest District; - (Stations: 21FLTPA 2755231827312 and 21FLTPA 2755231827312, represented for Mustang Creek (1492C); 21FLHILL151 and 21FLHILL111, for Turkey Creek (1578B); 21FLHILL154 English Creek (1552) and 21FLPOLKPOLEY CRK NI and 21FLPOLKPOLEY CRK S2, for Poley Creek (1583). **Figure 5.1** shows the locations of the water quality sites from which fecal coliform data were collected. **Figures 2.1A(B)** displays the data for fecal coliforms used in this analysis.

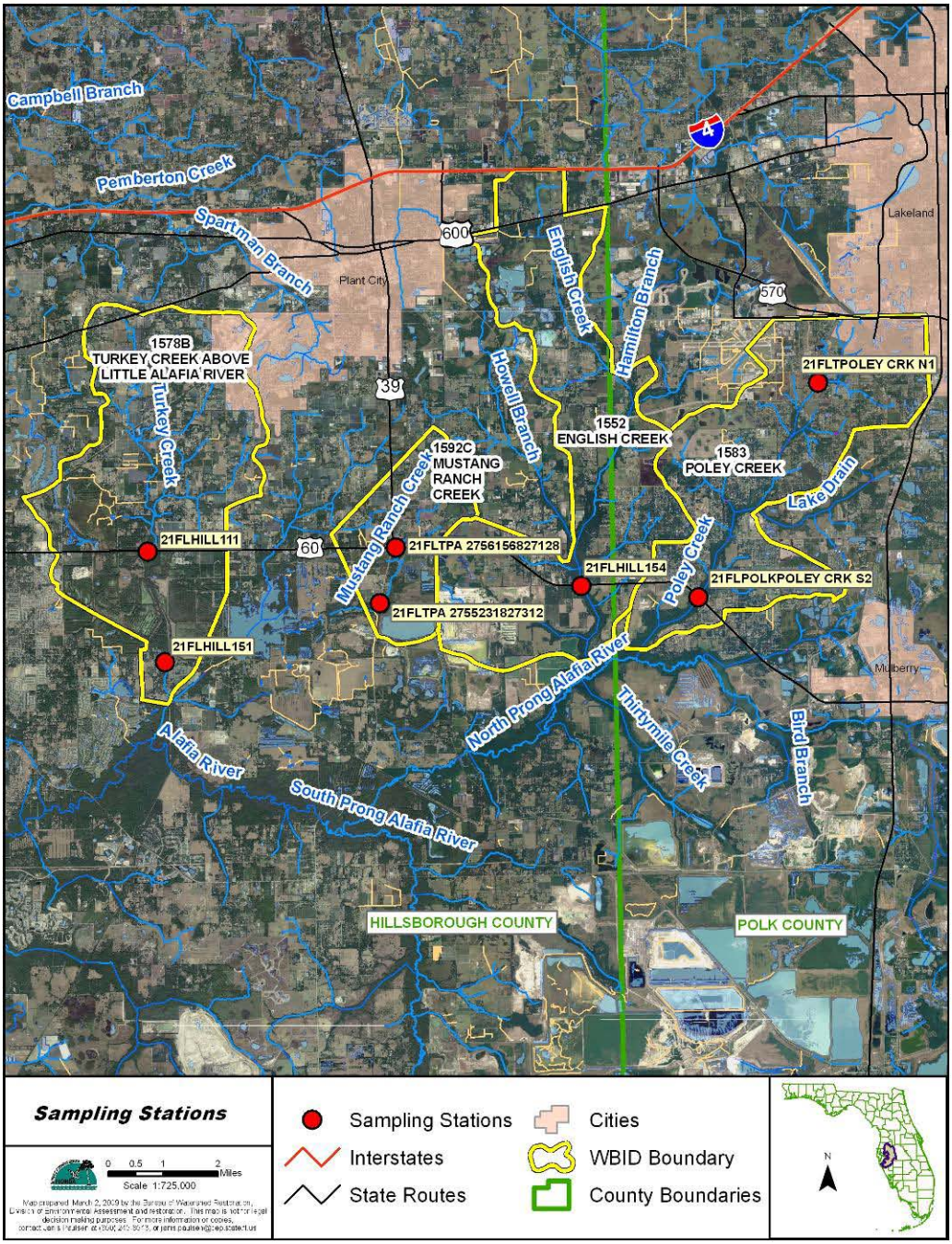


Figure 5.1. Locations of Water Quality Stations from which Water Quality Data Were Collected for This Report

5.1.2 TMDL Development Process for Mustang Ranch Creek, Turkey Creek, English Creek, and Poley Creek

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 4**:

$$(4)\quad \frac{[\text{measured exceedance} - \text{criterion}]*100}{\text{measured exceedance}}$$

The fecal coliform TMDL for Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) were calculated as the median of the percent reductions needed over the data range where exceedances occurred (see **Tables 5.1.A(B,C,D)** for data). As noted in the next section, exceedances occurred throughout the data period for Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) and the median percent reductions for this period were 88%, 64%, 40% and 67%, respectively.

Table 5.1.A Calculation of Percent Reduction in Fecal Coliform Necessary To Meet the Water Quality Standard of 400 Colonies/100mL in Mustang Ranch Creek, WBID 1592C

Station	Date	Fecal Coliform Exceedances	Fecal Coliform Target	% Reduction
21FLTPA 2755231827312	3/13/2007	3500	400	88.57
21FLTPA 2755231827312	10/1/2007	3300	400	87.88
21FLTPA 2755231827312	2/4/2008	709	400	43.58
21FLTPA 2755231827312	2/18/2008	4800	400	91.67
21FLTPA 2755231827312	5/5/2008	450	400	11.11
21FLTPA 2756156827128	7/25/2007	13600	400	97.06
			Median	**88.23**

Table 5.1.B Calculation of Percent Reduction in Fecal Coliform Necessary To Meet the Water Quality Standard of 400 Colonies/100mL in Turkey Creek, WBID 1578B

Station	Date	Fecal Coliform Exceedances	Fecal Coliform Target	% Reduction
21FLHILL151	12/12/2001	420	400	4.76
21FLHILL151	8/13/2003	440	400	9.09
21FLHILL151	10/19/2005	460	400	13.04
21FLHILL151	9/19/2007	460	400	13.04
21FLHILL151	12/11/2002	3080	400	87.01
21FLHILL151	3/21/2001	1440	400	72.22
21FLHILL151	9/15/2004	500	400	20.00
21FLHILL151	10/17/2007	520	400	23.08
21FLHILL151	6/15/2005	560	400	28.57
21FLHILL151	8/18/2004	1100	400	63.64
21FLHILL151	6/16/2004	1100	400	63.64
21FLHILL151	1/16/2002	1100	400	63.64
21FLHILL151	5/21/2003	4000	400	90.00
21FLHILL151	3/16/2005	680	400	41.18
21FLHILL151	7/16/2003	1520	400	73.68
21FLHILL151	3/19/2003	970	400	58.76
21FLHILL151	7/21/2004	800	400	50.00
21FLHILL151	3/17/2004	5800	400	93.10
21FLHILL151	7/25/2007	780	400	48.72
21FLHILL111	1/19/2005	800	400	50.00
21FLHILL111	1/14/2004	800	400	50.00
21FLHILL111	5/19/2004	800	400	50.00
21FLHILL111	6/15/2005	800	400	50.00
21FLHILL111	9/15/2004	900	400	55.56
21FLHILL111	10/20/2004	900	400	55.56
21FLHILL111	4/18/2007	900	400	55.56
21FLHILL111	7/16/2003	900	400	55.56
21FLHILL111	2/19/2003	900	400	55.56
21FLHILL111	4/21/2004	1000	400	60.00
21FLHILL111	1/17/2007	1000	400	60.00
21FLHILL111	6/19/2002	1000	400	60.00
21FLHILL111	6/19/2002	1000	400	60.00
21FLHILL111	8/17/2005	1100	400	63.64
21FLHILL111	1/17/2001	1100	400	63.64
21FLHILL111	9/21/2005	1100	400	63.64
21FLHILL111	10/8/2003	1200	400	66.67

21FLHILL111	8/15/2007	1300	400	69.23
21FLHILL111	10/19/2005	1300	400	69.23
21FLHILL111	9/17/2003	1300	400	69.23
21FLHILL111	8/18/2004	1400	400	71.43
21FLHILL111	12/20/2006	1400	400	71.43
21FLHILL111	4/17/2002	1400	400	71.43
21FLHILL111	4/17/2002	1400	400	71.43
21FLHILL111	3/19/2003	1400	400	71.43
21FLHILL111	11/19/2003	2100	400	80.95
21FLHILL111	7/21/2004	2200	400	81.82
21FLHILL111	6/16/2004	2200	400	81.82
21FLHILL111	11/15/2006	2200	400	81.82
21FLHILL111	2/20/2002	2260	400	82.30
21FLHILL111	2/20/2002	2260	400	82.30
21FLHILL111	12/12/2007	2400	400	83.33
21FLHILL111	10/17/2007	2400	400	83.33
21FLHILL111	1/16/2002	2440	400	83.61
21FLHILL111	1/16/2002	2440	400	83.61
21FLHILL111	3/21/2007	2700	400	85.19
21FLHILL111	4/16/2003	2700	400	85.19
21FLHILL111	10/18/2006	2800	400	85.71
21FLHILL111	3/17/2004	3400	400	88.24
21FLHILL111	12/10/2003	3600	400	88.89
21FLHILL111	12/11/2002	3900	400	89.74
21FLHILL111	12/12/2001	4700	400	91.49
21FLHILL111	9/19/2001	5700	400	92.98
21FLHILL111	3/21/2001	5800	400	93.10
21FLHILL111	11/28/2007	9800	400	95.92
21FLHILL111	11/14/2001	12500	400	96.80
21FLHILL111	5/21/2003	20000	400	98.00
21FLHILL111	7/25/2001	500	400	20.00
21FLHILL111	9/18/2002	500	400	20.00
21FLHILL111	1/15/2003	500	400	20.00
21FLHILL111	12/15/2004	600	400	33.33
21FLHILL111	7/25/2007	600	400	33.33
21FLHILL111	7/24/2002	600	400	33.33
21FLHILL111	7/24/2002	600	400	33.33
21FLHILL111	11/17/2004	700	400	42.86
21FLHILL111	7/20/2005	700	400	42.86
21FLHILL111	8/13/2003	700	400	42.86
21FLHILL111	10/16/2002	700	400	42.86
			Median	**63.64**

Table 5.1.C Calculation of Percent Reduction in Fecal Coliform Necessary To Meet the Water Quality Standard of 400 Colonies/100mL in the English Creek, WBID 1552

Station	Date	Fecal Coliform Exceedances	Fecal Coliform Target	% Reduction
21FLHILL162	11/19/2003	420	400	4.76
21FLHILL157	4/18/2001	440	400	9.09
21FLHILL154	4/18/2007	460	400	13.04
21FLHILL154	7/25/2007	480	400	16.67
21FLHILL154	11/28/2007	520	400	23.08
21FLHILL154	4/17/2002	540	400	25.93
21FLHILL155	6/19/2002	560	400	28.57
21FLHILL156	3/20/2002	560	400	28.57
21FLHILL160	12/10/2003	620	400	35.48
21FLHILL154	2/20/2002	640	400	37.50
21FLHILL154	12/12/2001	660	400	39.39
21FLHILL154	11/14/2001	680	400	41.18
21FLHILL154	9/21/2005	700	400	42.86
21FLHILL163	12/11/2002	740	400	45.95
21FLHILL161	5/21/2003	820	400	51.22
21FLHILL158	3/21/2001	880	400	54.55
21FLHILL159	2/21/2001	920	400	56.52
21FLHILL154	6/16/2004	1000	400	60.00
21FLHILL154	3/17/2004	1200	400	66.67
21FLHILL154	5/18/2005	4000	400	90.00
21FLHILL164	7/16/2003	4000	400	90.00
21FLHILL154	8/18/2004	10200	400	96.08
			Median	**40.29**

Table 5.1.D Calculation of Percent Reduction in Fecal Coliform Necessary To Meet the Water Quality Standard of 400 Colonies/100mL in the English Creek, WBID 1552

Station	Date	Fecal Coliform Exceedances	Fecal Coliform Target	% Reduction
21FLPOLKPOLEY CRK N1	3/22/2006	490	400	18.37
21FLPOLKPOLEY CRK N1	9/4/2007	530	400	24.53
21FLPOLKPOLEY CRK N1	12/8/2004	580	400	31.03
21FLPOLKPOLEY CRK N1	3/6/2007	590	400	32.20
21FLPOLKPOLEY CRK N1	12/19/2006	600	400	33.33
21FLPOLKPOLEY CRK N1	9/19/2005	660	400	39.39
21FLPOLKPOLEY CRK N1	6/12/2007	670	400	40.30
21FLPOLKPOLEY CRK S2	12/2/2003	1000	400	60.00
21FLPOLKPOLEY CRK N1	12/2/2002	1167	400	65.72
21FLPOLKPOLEY CRK N1	6/10/2008	1200	400	66.67
21FLPOLKPOLEY CRK N1	6/15/2004	1200	400	66.67
21FLPOLKPOLEY CRK S2	6/15/2004	1200	400	66.67
21FLPOLKPOLEY CRK S2	6/13/2005	1300	400	69.23
21FLPOLKPOLEY CRK N1	6/3/2003	1600	400	75.00
21FLPOLKPOLEY CRK N1	12/18/2007	2100	400	80.95
21FLPOLKPOLEY CRK N1	3/18/2008	2200	400	81.82
21FLPOLKPOLEY CRK N1	12/2/2003	2700	400	85.19
21FLPOLKPOLEY CRK N1	6/6/2006	3600	400	88.89
21FLPOLKPOLEY CRK N1	6/4/2002	9000	400	95.56
			Median	**66.67**

5.1.3 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 could 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 could also contribute to the exceedances

during dry weather conditions. The critical condition for point source loading typically occurs during periods of low stream flow, when dilution is minimized.

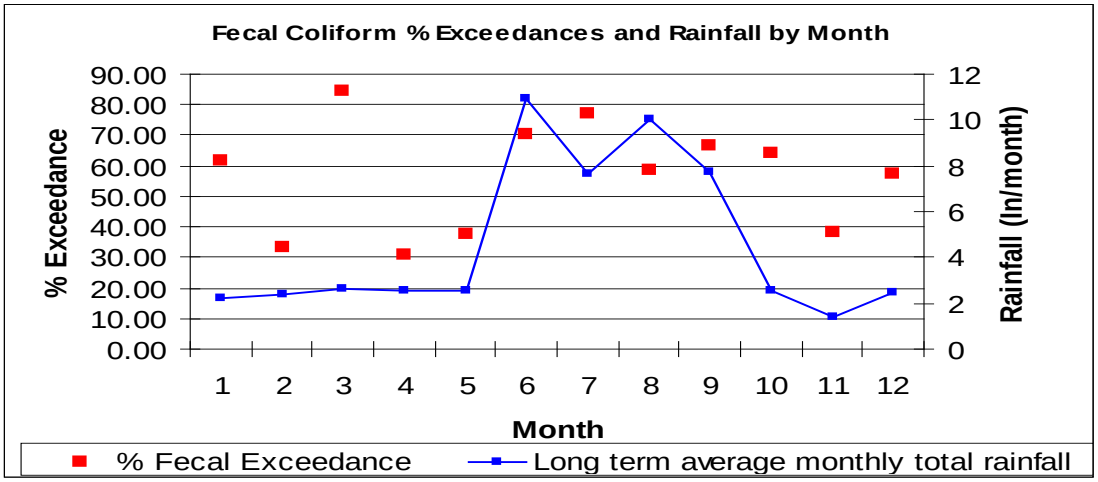
Based on the dominant type of landuse (residential and agriculture) in this watershed, it is likely that many of the exceedances may be coming from nonpoint sources and MS4s entering the waters through surface runoff. There were no flow gages to derive a flow duration curve; therefore, rainfall data was used to compare with the measured fecal coliform data for each waterbody. Measurements were sorted by month and season (the calendar year was divided into quarters) to determine whether there was a temporal pattern of exceedances. Monthly rainfall data from Plant City (087205) and the City of Lakeland (084802) were also obtained and included in the analysis. **Tables 5.2A(B,C,D)** presents summary statistics by month and season, respectively, for fecal coliform measurements (*Winter*: January–March; *Spring*: April–June; *Summer*: July–September; *Fall*: October–December). Fecal coliform exceedances occur throughout all seasons in all the water bodies, except there were not enough data to determine long term seasonal evidence of increased fecal exceedances for Mustang Ranch Creek (WBID 1592C), as this water body became impaired based on the IWR rule, with 6 out of 6 samples exceeding the criteria. There were insufficient data for monthly fecal exceedances for Poley Creek as the samples were pulled yearly but once during each season. Fecal Coliform exceedances occur throughout all seasons in these waterbodies, implying potential fecal coliform bacteria sources during both baseflow and surface runoff events. **Figures 5.2A(B,C)** show this information graphically.

Table 5.2.A Summary Statistics of Fecal Coliform Data for Mustang Ranch Creek WBID 1592C, by Month and Season, 2000-2007

Month	Number of Cases	Minimum	Maximum	Median	Mean	Number of Exceedances	% Exceedances of Cases	Rainfall Mean
2	2	709	4800	2754.5	2754.5	2	100	2.39
3	1			3500	3500	1	100	2.6
5	1			450	450	1	100	2.57
7	1			13600	13600	1	100	7.61
10	1			3300	3300	1	100	2.55
Season	**Number of Cases**	**Minimum**	**Maximum**	**Median**	**Mean**	**Number of Exceedances**	**% Exceedances of Cases**	**Rainfall Mean**
1	3	709	4800	3500	3003	3	100	7.2
2	1	450	450	450	450	1	100	16.04
3	1	13600	13600	13600	13600	1	100	25.34
4	1	3300	3300	3300	3300	1	100	6.41

Table 5.2.B Summary Statistics of Fecal Coliform Data for Turkey Creek WBID 1578B, by Month and Season, 2000-2007

Month	Number of Cases	Minimum	Maximum	Median	Mean	Number of Exceedances	% Exceedances of Cases	Rainfall Mean
1	13	20	2440	800	813.08	8	61.54	2.21
2	12	20	2260	220	666.67	4	33.33	2.39
3	13	20	5800	1600	2120.77	11	84.62	2.6
4	13	20	2700	200	643.85	4	30.77	2.52
5	8	20	20000	240	3171.25	3	37.50	2.57
6	10	20	2200	900	842.00	7	70.00	10.95
7	13	20	2200	600	732.31	10	76.92	7.61
8	12	230	1700	570	770.83	7	58.33	10.01
9	12	110	5700	500	1084.17	8	66.67	7.72
10	14	60	2800	520	907.86	9	64.29	2.55
11	13	20	12500	300	2200.77	5	38.46	1.37
12	14	40	4700	510	1482.86	8	57.14	2.49
Season	**Number of Cases**	**Minimum**	**Maximum**	**Median**	**Mean**	**Number of Exceedances**	**% Exceedances of Cases**	**Rainfall Mean**
1	38	20	5800	800	1200.17	23	59.83	7.2
2	31	20	20000	240	1552.37	14	46.09	16.04
3	37	20	5700	570	862.44	25	53.30	25.34
4	41	20	12500	510	1530.49	22	63.10	6.41



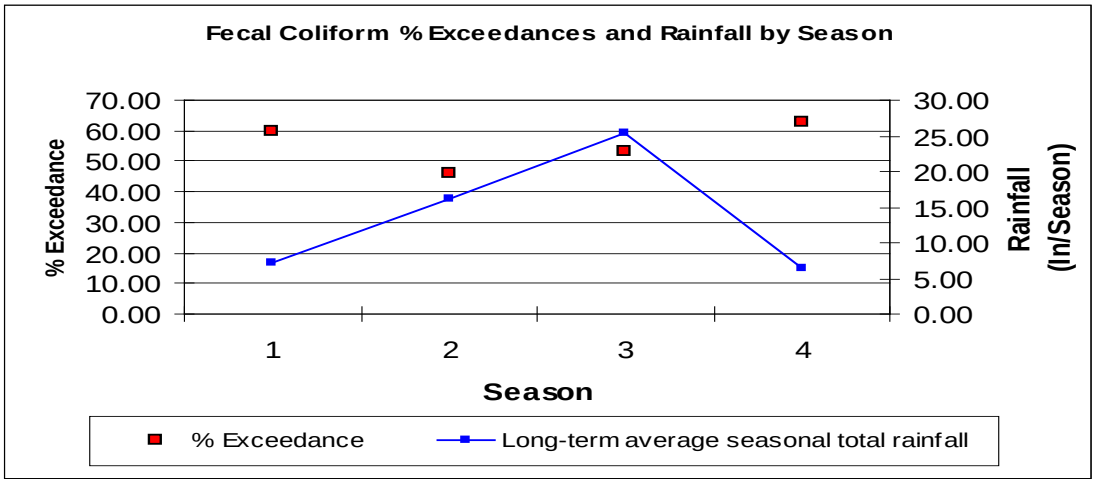
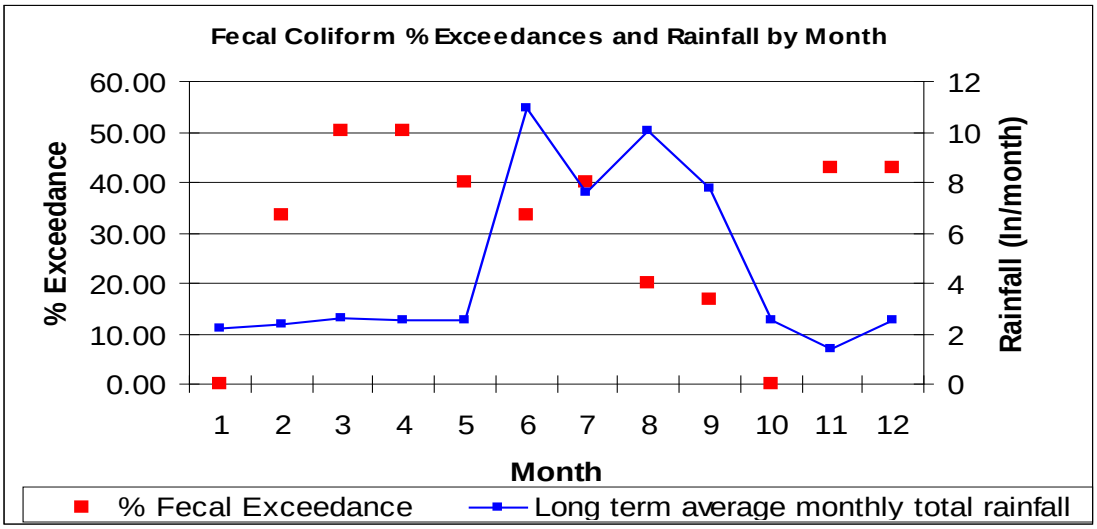


Figure 5.2A. Fecal Coliform Exceedances and Rainfall for the Turkey Creek WBID 1578B, by Month, 2000-2007

Table 5.2.C Summary Statistics of Fecal Coliform Data for English Creek, WBID 1552, by Month and Season, 2000-2007

Month	Number of Cases	Minimum	Maximum	Median	Mean	Number of Exceedances	% Exceedances of Cases	Rainfall Mean
1	6	100	380	180	223.33	0	0.00	2.21
2	6	40	920	170	341.67	2	33.33	2.39
3	6	240	1200	470	593.33	3	50.00	2.6
4	6	140	540	410	1032.00	3	50.00	2.52
5	5	20	4000	300	1032.00	2	40.00	2.57
6	6	60	1000	190	350.00	2	33.33	10.95
7	5	80	4000	200	984.00	2	40.00	7.61
8	5	40	10200	160	2130.00	1	20.00	10.01
9	6	50	700	230	265.00	1	16.67	7.72
10	7	80	290	180	178.57	0	0.00	2.55
11	7	60	680	360	360.00	3	42.86	1.37
12	7	120	740	320	402.86	3	42.86	2.49
Season	**Number of Cases**	**Minimum**	**Maximum**	**Median**	**Mean**	**Number of Exceedances**	**% Exceedances of Cases**	**Rainfall Mean**
1	18	40	1200	270	386.11	5	27.78	7.2
2	17	20	140	300	552.94	7	41.18	16.04
3	16	40	10200	185	1072.50	4	25.00	25.34
4	21	60	740	240	313.81	6	28.57	6.41



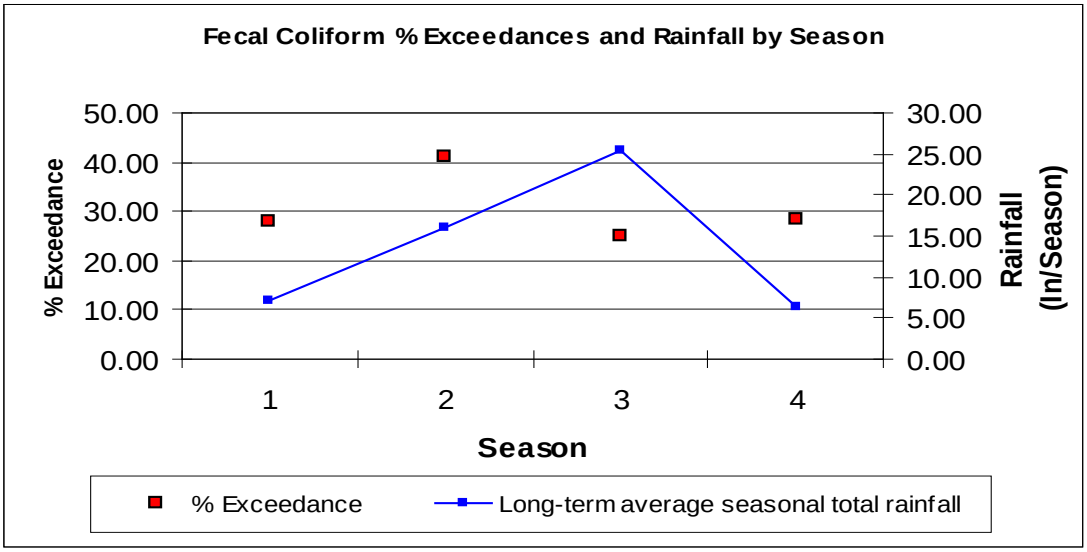


Figure 5.2B. Fecal Coliform Exceedances and Rainfall for the English Creek, WBID 1552, by Month and Season, 2000–2007

Table 5.2.D Summary Statistics of Fecal Coliform Data for Poley Creek WBID 1583, by Month and Season, 2000-2007

Month	Number of Cases	Minimum	Maximum	Median	Mean	Number of Exceedances	% Exceedances of Cases	Rainfall Mean
1	0	0	0	0	0	0	0	2
2	0	0	0	0	0	0	0	2
3	8	99	2200	295	525	3	38	3
4	0	0	0	0	0	0	0	3
5	0	0	0	0	0	0	0	3
6	13	27	9000	1200	1586	8	62	11
7	0	0	0	0	0	0	0	8
8	0	0	0	0	0	0	0	10
9	6	130	660	400	377	2	33	8
10	0	0	0	0	0	0	0	3
11	0	0	0	0	0	0	0	1
12	12	70	2700	490	821	6	50	2
Season	**Number of Cases**	**Minimum**	**Maximum**	**Median**	**Mean**	**Number of Exceedances**	**% Exceedances of Cases**	**Rainfall Mean**
1	8	99	2200	295	525	3	38	7
2	13	27	9000	1200	1586	8	62	16
3	6	130	660	400	377	2	33	25
4	12	70	2700	490	821	6	50	6

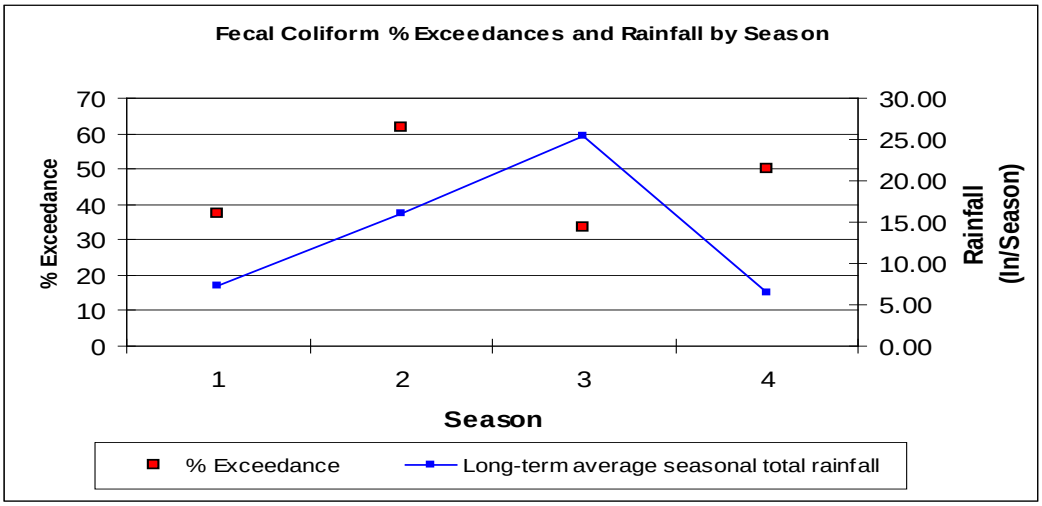


Figure 5.2C. Fecal Coliform Exceedances and Rainfall for the Poley Creek, WBID 1583, by Season, 2000–2007

5.1.4 Spatial Patterns

Mustang Ranch Creek (WBID 1592C)

For Mustang Ranch Creek, Station 21FLTPA2756156827128 upstream, and station 21FLTPA2756156827312, downstream did not present any spatial pattern. There was only one sample from the upstream station, **Table 5.3.**

Turkey Creek (WBID 1578B)

Turkey Creek with only two stations L21FLHILL111 upstream and21FLHILL151 downstream presented a pattern. Of the 74 samples collected from the upstream station 66 exceeded the criteria and for the station downstream, of the 73 only 11 exceeded the criteria. The data showed higher fecal coliform counts upstream which is closer to high residential and agricultural areas.

English Creek (WBID 1552)

English Creek had no spatial pattern, there was only one station being sampled for fecal coliform.

Poley Creek (WBID 1583)

Poley Creek presented a similar pattern as Turkey Creek, where the upstream station (21FLTPOLEY CRK N1), had more fecal coliform counts (15 out of 19) than the downstream station (21FLTPOLEY CRK S2) which had 3 exceedances out of 18. Poley creek's upstream station is closer to the City of Lakeland and has a higher population than the area which encompasses downstream.

Table 5.3. Station Summary Statistics of Fecal Coliform Data for Mustang Ranch Creek, Turkey Creek, English Creek and Poley Creek

WBID	Station	# of Samples	Average	Min	Max
1592C	21FLTPA 2755231827312	5	2552	450	4800
1592C	21FLTPA 2756156827128	1	13600	13600	13600
1578B	21FLHILL111	74	2035	100	20000
1578B	21FLHILL151	73	432	20	5800
1552	21FLHILL154	72	557	20	10200
1583	21FLPOLKPOLEY CRK N1	19	1509	320	9000
1583	21FLPOLKPOLEY CRK S2	18	355	27	1300

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 Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) are expressed in terms of a percent reduction, these TMDLs represent the maximum daily fecal coliform loads the stream can assimilate and maintain the fecal coliform criterion **(Table 6.1).**

Table 6.1. TMDL Components for Fecal Coliform in Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552) and Poley Creek (WBID 1583)

WBID	Parameter	TMDL (counts/day)	WLA		LA (% reduction)	MOS
			Wastewater (counts/day)	NPDES Stormwater (% reduction)		
1592C	Fecal Coliform	*400 #/100mL	N/A	88	88	Implicit
1578B	Fecal Coliform	*400 #/100mL	must meet permit limits	64	64	Implicit
1552	Fecal Coliform	*400 #/100mL	N/A	40	40	Implicit
1583	Fecal Coliform	*400 #/100mL	N/A	67	67	Implicit

N/A – Not applicable.

*Fecal colfiorm criterion (62-302.530(6), Class II).

6.2 Load Allocation

Fecal coliform reductions of 88, 64, 40 and 67 percent for Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) are needed from nonpoint sources. It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the water management districts that are not part of the NPDES Stormwater Program (see **Appendix A).**

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

There is one NPDES-permitted wastewater facility: FL0040983 (Valrico Advance Waste Water Treatment Facility (AWWTF)) identified in Turkey Creek (WBID 1578B). The discharge Location is approximately 27 57’ 30” latitude north and 82 12’ 30” longitude west. The existing system is a 3.0 mgd annual average daily flow (AADF) outfall and a monthly average maximum of < 75 % detection, and 25 counts for one single sample, however there is no limit in the permit of units counts /100mL. There is a land application reuse system of 2.0 mgd daily flow with fecal coliform. The state already requires all NPDES point source dischargers to meet bacteria criteria at the end of the pipe. It is the Department’s current practice not to allow mixing zones for bacteria. These requirements will also be applied to any possible future point sources that may discharge in the watershed to meet end-of-pipe standards for coliform bacteria. These facilities must meet its permit limits for fecal coliform as stated in their permit requirement.

6.3.2 NPDES Stormwater Discharges

The WLA for stormwater discharges with an MS4 permit is: 88, 64, 40 and 67 percent reduction for fecal coliform in Mustang Ranch Creek (WBID 1592C), Turkey Creek (WBID 1578B), English Creek (WBID 1552), and Poley Creek (WBID 1583) respectively. . It should be noted that any MS4 permittee is only responsible for reducing the anthropogenic loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Department, February 2001), an implicit MOS was used in the development of this TMDL. An MOS was included in the TMDL by meeting the water quality criterion of 400 colonies/100mL, while the actual criterion allows for a 10 percent exceedance over that level.

Chapter 7: TMDL IMPLEMENTATION

TMDL Implementation

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

If the Department determines a BMAP is needed to support the implementation of this TMDL, a BMAP will be developed through a transparent stakeholder-driven process intended to result in a plan that is cost-effective, technically feasible, and meets the restoration needs of the applicable waterbodies. Once adopted by order of the Department Secretary, BMAPs are enforceable through wastewater and municipal stormwater permits for point sources and through BMP implementation for nonpoint sources. Among other components, BMAPs typically include:

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

BMAPs are updated through annual meetings and may be officially revised every five years. Completed BMAPs in the state have improved communication and cooperation among local stakeholders and state agencies, improved internal communication within local governments, applied high-quality science and local information in managing water resources, clarified obligations of wastewater point source, MS4 and non-MS4 stakeholders in TMDL

implementation, enhanced transparency in DEP decision-making, and built strong relationships between DEP and local stakeholders that have benefited other program areas.

However, in some basins, and for some parameters, particularly those with fecal coliform impairments, the development of a BMAP using the process described above will not be the most efficient way to restore a waterbody, such that it meets its' designated uses. Why? Because fecal coliform impairments result from the cumulative effects of a multitude of potential sources, both natural and anthropogenic. Addressing these problems requires good old fashioned detective work that is best done by those in the area. There are a multitude of assessment tools that are available to assist local governments and interested stakeholders in this detective work. The tools range from the simple – such as Walk the WBIDs and GIS mapping - to the complex such as Bacteria Source Tracking. Department staff will provide technical assistance, guidance, and oversight of local efforts to identify and minimize fecal coliform sources of pollution. Based on work in the Lower St Johns River tributaries and the Hillsborough River basin, the Department and local stakeholders have developed a logical process and tools to serve as a foundation for this detective work. In the near future, the Department will be releasing these tools to assist local stakeholders with the development of local implementation plans to address fecal coliform impairments. In such cases, the Department will **rely on these local initiatives** as a more cost-effective and simplified approach to identify the actions needed to put in place a roadmap for restoration activities, while still meeting the requirements of Chapter 403.067(7), F.S.

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Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

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

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

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

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

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