TOTAL MAXIMUM DAILY LOAD (TMDL)

For

Fecal and Total Coliform

In

Upper and Middle Peace River Basin

(WBIDs 1501A, 1580, 1613, 1623K and 1871)

Prepared by:

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EPA United States Environmental Protection Agency

Region 4 serving the southeast

In compliance with the provisions of the Federal Clean Water Act, 33 U.S.C §1251 et. seq., as amended by the Water Quality Act of 1987, P.L. 400-4, the U.S Environmental Protection Agency is hereby establishing the Total Maximum Daily Load (TMDL) for fecal and total coliforms in the Peace River Basin (WBIDs1501A, 1580, 1613, 1623K and 1871). Subsequent actions must be consistent with this TMDL.

/s/ 2/23/2006

James D. Giattina, Director
Water Management Division

Date

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LIST OF ABBREVIATIONS

AWT	Advanced Waste Treatment
BMP	Best Management Practices
BPJ	Best Professional Judgment
CFS	Cubic Feet per Second
DEM	Digital Elevation Model
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
F.A.C.	Florida Administrative Code
GIS	Geographic Information System
HUC	Hydrologic Unit Code
LA	Load Allocation
MGD	Million Gallons per Day
MOS	Margin of Safety
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer Systems
NASS	National Agriculture Statistics Service
NLCD	National Land Cover Data
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OSTD	Onsite Sewer Treatment and Disposal Systems
PLRG	Pollutant Load Reduction Goal
Rf3	Reach File 3
RM	River Mile
STORET	STORage RETrieval database
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WBID	Water Body Identification
WLA	Waste Load Allocation
WMP	Water Management Plan
WWTF	Wastewater Treatment Facility

SUMMARY SHEET
Total Maximum Daily Load (TMDL)

1. 303(d) Listed Waterbody Information
State: Florida
Major River Basin: Peace (03100101)

Impaired Waterbodies for TMDLs (1998 303(d) List):

WBID	Segment Name and Type	River Basin	County	Constituent(s)
1501A	Lake Lena Run	Peace	Polk	Fecal Coliform
1580	Wahneta Farms Drain Canal	Peace	Polk	Total Coliform
1613	Peace Creek Tributary Canal	Peace	Polk	Fecal Coliform
1623K	Saddle Creek Above Lake Hancock	Peace	Polk	Fecal Coliform
1871	Alligator Branch	Peace	Hardee	Fecal Coliform

2. TMDL Endpoints (i.e., Targets) for Class III Waters (fresh and marine):
Fecal Coliform: 400 MPN/100mL
Total Coliform: 2400 MPN/100mL

3. Fecal Coliform Allocation:

WBID	$WLA_{Continuous}$ (MPN/day)	WLA_{MS4} (reduction)	LA	TMDL	Reduction
1501A	2.95×10^{10} (see note 2)	N/A (see note 1)	66 percent reduction	66 percent reduction	66%
1613	N/A	11%	3.06×10^{10} MPN/day	3.06×10^{10} MPN/day	11%
1623K	N/A	N/A	11 percent reduction	11 percent reduction	11%
1871	N/A	63%	63 percent reduction	63 percent reduction	63%

Notes:
1. N/A = not applicable
2. The continuous loads into Lake Lena Run (WBID 1501A) cannot cumulatively exceed 2.95×10^{10} counts/100mL based on the 200 count/100mL permit limits; the Auburndale sewage treatment plant (STP) cannot exceed 1.06×10^{10} MPN/day and the Florida Distiller cannot exceed 1.89×10^{10} MPN/day based on the 200 MPN/100mL permit limit average annual and 30 day average, respectively. The Auburndale STP cannot exceed 4.24×10^{10} MPN/day based on the daily maximum permit limit of 800 MPN/100mL. The Florida Distiller cannot exceed 3.79×10^{10} MPN/day based on the 7-day permit limit of 400 MPN/100mL.

4. Total Coliform Allocation:

WBID	$WLA_{Continuous}$ (MPN/day)	WLA_{MS4} (reduction)	LA (reduction)	TMDL (reduction)
1580	N/A_1	14%	14 percent reduction	14%

Notes:
1. N/A = not applicable

5. Endangered Species (yes or blank): Yes

6. EPA Lead on TMDL (EPA or blank): EPA

7. TMDL Considers Point Source, Nonpoint Source, or both: Both

8. Major NPDES Discharges to surface waters addressed in TMDLs:

Facility Name	NPDES No.	Facility Type	Impacted Stream	Permit Limits	
				Monthly Average/ Annual Average	Daily Maximum / 7 day average
Auburndale STP	FL0021466	Sewage Treatment Plant (STP)	Lake Lena Run	200 MPN/100ml (Fecal Coliform)	800 MPN/100ml (Fecal Coliform)
Florida Distillers	FL0003051	Distiller	Lake Lena Run	200 MPN/100ml (Fecal Coliform)	400 MPN/100ml (Fecal Coliform)

TOTAL MAXIMUM DAILY LOAD (TMDL)
FECAL AND TOTAL COLIFORM IN UPPER AND MIDDLE PEACE RIVER BASIN

1. INTRODUCTION

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those water bodies that are not meeting water quality standards. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water quality based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Florida Department of Environmental Protection (FDEP) developed a statewide, watershed-based approach to water resource management. Under the watershed management approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political boundaries. The watershed management approach is the framework DEP uses for implementing TMDLs. The state's 52 basins are divided into 5 groups. Water quality is assessed in each group on a rotating five-year cycle. The Group 3 basin includes waters in the following basins: Caloosahatchee River, Chocotawhatchee-St. Andrew, Sarasota Bay, Peace River, Charlotte Harbor and the Upper and Lower St. Johns River. Group 3 waters were first assessed in 2002 with plans to revisit water management issues in 2007**.** FDEP established five water management districts (WMD) responsible for managing ground and surface water supplies in the counties encompassing the districts. The Peace River Basin is in the Southwest Florida Water Management District (SWFWMD).

For the purpose of planning and management, the WMDs divided the district into planning units defined as either an individual primary tributary basin or a group of adjacent primary tributary basins with similar characteristics. These planning units contain smaller, hydrological based units called drainage basins, which are further divided into "water segments". A water segment usually contains only one unique waterbody type (stream, lake, cannel, etc.) and is about 5 square miles. Unique numbers or waterbody identification (WBIDs) numbers are assigned to each water segment.

2. PROBLEM DEFINITION

Florida's final 1998 Section 303(d) list identified numerous WBIDs in the Peace River Basin as not supporting water quality standards (WQS). After assessing all readily available water quality data, EPA is responsible for developing coliform TMDLs in five WBIDs (see Table 1). The geographic locations of the impaired WBIDs in Polk County and Hardee County are shown in Figure 1. The TMDLs addressed in this document are being established pursuant to EPA commitments in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998).

Table 1. Fecal and Total Coliform TMDLs in Peace River Basin

WBID	Name	Planning Unit	Parameter of Concern
1501A	Lake Lena Run	Upper Peace River	Fecal Coliform
1580	Wahneta Farms Drain Canal	Upper Peace River	Total Coliform
1613	Peace Creek Tributary Canal	Upper Peace River	Fecal Coliform
1623K	Saddle Creek Above Lake Hancock	Upper Peace River	Fecal Coliform
1871	Alligator Branch	Middle Peace River	Fecal Coliform

The waterbodies listed in Table 1 are designated as Class III waters. The designated use of Class III waters is recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Class III waters are further categorized based on fresh or marine waters. Water quality criteria for fecal and total coliform do not vary between Class III fresh or marine waters. None of the waterbodies listed in Table 1 are classified as marine waters.

To determine the status of surface water quality in the state, three categories of data – chemistry data, biological data, and fish consumption advisories – were evaluated to determine potential impairments. The level of impairment is defined in the Identification of Impaired Surface Waters Rule (IWR), Section 62-303 of the Florida Administrative Code (F.A.C.). The IWR defines the threshold for determining if waters should be included on the state's planning list and verified list. Potential impairments are determined by assessing whether a waterbody meets the criteria for inclusion on the planning list. Once a waterbody is on the planning list, additional data and information will be collected and examined to determine if the water should be included on the verified list.

The format of the remainder of this report is as follows: Chapter 3 is a general description of the impaired watersheds; Chapter 4 describes the water quality standard and target criteria for the TMDLs; and Chapter 5 describes the development of the coliform TMDLs.

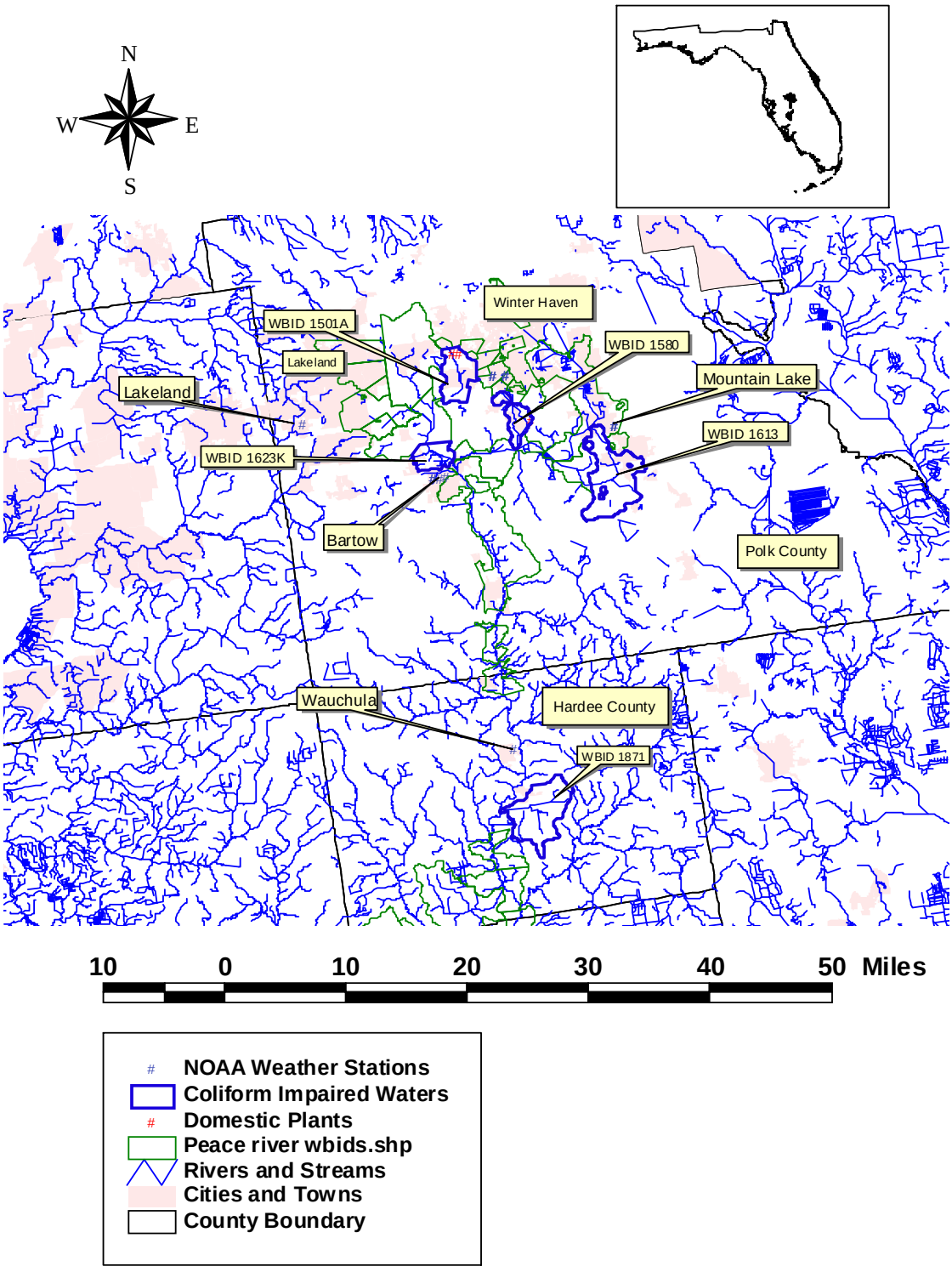

Figure 1: Peace River Basin

3. WATERSHED DESCRIPTION

The Peace River drainage basin is approximately 2,350 square miles, which is the largest drainage basin in the Southwest Florida Management District (SWFWMD). The Peace River is free flowing over its entire reach, which is approximately 105 miles. The headwater tributary streams of the Peace River occur in northern Polk County, with the river itself beginning at the junction of Saddle Creek and the Peace Creek Drainage Canal near Bartow. The Peace River discharges into the northeastern portion of Charlotte Harbor, Florida's second largest estuary, which is near the city of Punta Gorda. The flows from the Peace River are vital to the estuarine health and overall productivity of Charlotte Harbor.

Land within the basin has been considerably altered from the natural state by phosphate mining, agriculture, and other development. Additionally, considerable amounts of water are withdrawn each day to support these land uses. Ground water has historically provided the majority of this water, but surface water use for public supply is increasing in the southern part of the basin (http://www.swfwmd.state.fl.us/waterman/peaceriver/). Land cover distribution for the impaired WBIDs is shown in Table 2.

A steady, long-term decline in Peace River flows has been observed since the early-1960s. The causes of the decline are complex. Average annual rainfall over the last 30 years is about five inches/year lower than in the previous 30 years. Ground-water withdrawals for public supply, agriculture, and mining have lowered the potentiometric surface of the Floridian aquifer since the early-1930s which has reversed the hydraulic gradient between the river and underlying confined aquifers. This has caused gravity drainage of the river into sinkholes in the upper part of the basin (http://www.swfwmd.state.fl.us/waterman/peaceriver/).

The cumulative effects of land use changes due to urbanization, agriculture, and mining can change stormwater runoff and baseflow contributions to the river. Drainage of wetlands through ditching and canal construction can affect surface water storage and runoff patterns. Historic phosphate mining and reclamation of mined lands can alter the timing and magnitude of runoff, surface water storage, recharge, and evapotranspiration. All of these factors contribute to changes in hydrology and ecology within the Peace River basin (http://www.swfwmd.state.fl.us/waterman/peaceriver/).

To address the potential effect of these activities in the basin, the Florida Legislature directed the Florida Department of Environmental Protection (DEP) in its 2003 legislative session to assess the cumulative impacts to the Peace River basin. This study, called the Peace River Cumulative Impact Assessment, will form the basis for preparation of a resource management plan. The subsequent resource management plan (not a part of the Peace River Cumulative Impact Assessment) will identify regulatory and non-regulatory means to minimize future impacts for the basin (http://www.swfwmd.state.fl.us/waterman/peaceriver/).

Of the WBIDs presented in this TMDL report, four are located in the Upper Peace Basin, while Alligator Branch (WBID 1871) is located in the Middle Peace Basin. The Upper Peace River Basin is 615 square miles, which begins in the Green Swamp. The waterbodies identified in this TMDL report are all located in Polk County; however, the entire Upper Peace River Basin includes the majority of Polk, Hardee and DeSoto Counties. All waterbodies located within Polk County that collect or receive storm water discharges from regulated Phase I MS4 areas are subject to the appropriate provisions of the NPDES Phase1 MS4 permit. Polk County is the

lead applicant in the permit, and is responsible for the coordination of information and efforts to be reported in the annual reports. Additionally, via interlocal agreements and MOAs, Polk County may be responsible for the actual implementation of stormwater requirements as stated in the permit. However, each permittee covered in the permit is ultimately responsible for the MS4 discharges resulting from their jurisdiction, including TMDLs and WLAs. The Middle Peace River Basin is bounded by Payne Creek on the northern end and by Horse Creek and Joshua Creek on the southern end. The Middle Peace River Basin is approximately 1,155 square miles. Alligator Creek is located in Hardee County. The Upper and Middle Peace Basin are identified by HUC 03100101. The following descriptions of the impaired watersheds are from the Basin Status Report (FDEP, 2003). These documents should be consulted for additional details.

Lake Lena Run (WBID 1501A) is located in Polk County in the Upper Peace River Basin. Lake Lena Run is a Class III fresh water. Lake Lena Run originates in Auburndale and enters Lake Hancock on the northeast side. The land cover in the WBID is predominately Commercial, Industrial, and public (26%) as well as residential (20%). The drainage area of Lake Lena Run is not within any Phase I or II MS4 jurisdiction. There are two NPDES permitted discharges to Lena Run, AUBURNDALE ALLRED WWTP NPDES FL0021466, and FLORIDA DISTILLERS CO @AUBURNDALE NPDES FL0003051. A third facility, COCA COLA FOODS, discharged to Lena Run until around December 1993 when the permit became inactive. There was a water quality based effluent limit analysis performed on Lena Run for permitting purposes.

Wahneta Farms Drain Canal (WBID 1580) is located in Polk County in the Upper Peace River Basin. Wahneta Farms Drain Canal is a Class III fresh water, which receives flow from the Winter Haven Chain of Lakes. Wahneta Farms Drain Canal is located near the town of Wahneta, which has an MS4 permit that may discharge to the canal (FLS000015). Land cover in the WBID is predominately agriculture (41%) and residential (30%).

Peace Creek Tributary Canal (WBID 1613) is located in Polk County and in the Upper Peace River Basin. Peace Creek Tributary Canal is a Class III fresh water. The Canal flows from Peace Creek and discharges into the Peace River. This area overlaps the MS4 area from the town of Lake Wales (FLS000015) and may receive discharges from these storm sewer systems. There are no NPDES permitted facilities discharging directly into this WBID. Land cover in the WBID is predominately agriculture (49%) and wetlands (20%).

Saddle Creek below Hancock (WBID 1623K) is located in Polk County and in the Upper Peace River Basin. The drainage area in this WBID is not within any Phase I or II MS4 jurisdiction. Land cover in the WBID is predominately agriculture (56%) and wetlands (21%). Saddle Creek below Hancock is a Class III fresh water. Flows from Lake Hancock enter Saddle Creek below Hancock via a weir. The weir, which was completed in 1962, regulates stream flow so that the flow data reported did not represent actual flow conditions in the WBID. Thus, the flow data was not used in the TMDL development analysis. Saddle Creek then joins with Peace Creek to form the Peace River just northeast of the City of Bartow. The Peace River then travels more than 100 miles until it empties into Charlotte Harbor, a SWIM priority water body, and an “estuary of national significance” via its inclusion in the U.S. EPA’s National Estuary Program.

Alligator Branch (WBID 1871) is located in Hardee County and in the Middle Peace River Basin. Alligator Branch is a Class III fresh water stream. Alligator Branch flows into Peace Creek and is considered to be a blackwater stream, which has an average color of 169 pcu (platinum

cobalt unit). Blackwater streams are characterized by warm water temperatures, low stream gradient, extensive riparian swamps and darkly stained waters from humic substances. In addition, blackwater streams often have periods of low dissolved oxygen due to the high content of naturally occurring organic matter from wetlands areas. The land cover in the WBID is predominately agriculture (56%) and wetlands (24%). There are no MS4s or any other permitted NPDES dischargers in the watershed.

Table 2. Land Cover Distribution[1] (acres)

WBID	Residential		Commercial, Industrial, Public		Agriculture		Rangeland		Forest		Water		Wetlands		Barren & Extractive		Transportation & Utilities		Total (acres)
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	
Peace River Basin																			
1501A	1376	20.4	1776	26.4	992	14.7	317	4.7	556	8.3	92	1.4	1265	18.8	159	2.4	201	3.0	6734
1580	1243	30.2	266	6.5	1703	41.3	65	1.6	251	6.1	36	0.9	520	12.6	0.0	0.0	36	0.9	4121
1613	989	6.8	1266	8.7	7127	49.1	641	4.4	941	6.5	362	2.5	2892	19.9	40	0.3	245	1.7	14505
1623K	104	2.5	42	1.0	1916	45.8	7.0	0.2	595	14.8	22	0.5	894	21.4	503	12.0	98	2.3	4182
1871	481	3.7	48	0.4	7241	55.6	879	6.7	1304	10.0	17	0.1	3058	23.5	0.0	0.0	0.0	0.0	13028

Notes:
1. Acreage represents the land use distribution in the impaired WBID and not the entire drainage area of the impaired WBID.
2. Public lands include urban and recreational areas.
3. Rangeland includes shrubland, grassland, and herbaceous land covers.
4. Data source is SJRWMD landuse cover of 2000.

4. WATER QUALITY STANDARD AND TARGET IDENTIFICATION

Waterbodies in the impaired WBIDs are classified as Class III waters. The designated use classification for Class III waters is recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The water quality criteria for protection of Class III waters are established by the State of Florida in the Florida Administrative Code (F.A.C.), Section 62-302.530. The individual criteria should be considered in conjunction with other provisions in water quality standards, including Section 62-302.500 F.A.C. [Surface Waters: Minimum Criteria, General Criteria] that apply to all waters unless alternative or more stringent criteria are specified in F.A.C. Section 62-302.530. In addition, unless otherwise stated, all criteria express the maximum not to be exceeded at any time. The specific criteria addressed in this document are as follows:

Fecal Coliform Bacteria (Class III Waters)

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. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. The geometric mean criteria reflect chronic or long-term water quality conditions whereas the 400 and 800 values reflect acute or short-term conditions.

The target for the TMDLs is the not to exceed 10 percent criteria, as this is the more stringent of the acute criteria. When flow data are available in the WBID, the fecal coliform TMDLs are expressed as daily loads in units of MPN per day. The fecal coliform TMDLs are also expressed in terms of the percent reduction required to achieve water quality standards. When flow data are not available in the WBID or due to hydrologic and/or geologic conditions it is not possible to estimate flow (i.e., tidal influence or karst geologic formation), the TMDLs are expressed only as percent reductions.

It is appropriate to use the more stringent of the acute criteria for fecal coliform TMDL development as the data indicates violations of the standard are typically related to storm events, which are short-term in nature. Violations of the chronic criteria are typically associated with point sources or non-point source continuous discharges (e.g., leaking septic systems) and typically occur during all weather conditions. Targeting the acute criteria should be protective of the chronic criteria.

Total Coliform Bacteria (Class III Waters)

The MPN per 100 ml of total coliform bacteria shall be less than or equal to 1,000 as a monthly average nor exceed 1,000 in more than 20 percent of the samples examined during any month, and less than or equal to 2,400 at any time. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period.

The target for the total coliform TMDLs is the one-day maximum concentration of 2400 MPN/100mL, as less than 10 samples were collected in a 30-day period to determine violations of the geometric mean. Total coliform bacteria generally indicate the presence of soil-associated bacteria and result from natural influences on a water body such as rainfall runoff as well as

sewage inflows (i.e., acute conditions). By protecting the acute criteria (i.e., one-day maximum) bacteria concentrations in the stream should meet the chronic criteria. The not to exceed criteria is not selected as the target because there are no known health risks associated with soil-born bacteria and using this criterion for the target would likely result in overly conservative reductions.

5. FECAL AND TOTAL COLIFORM TMDLS

This section of the report details the development of the coliform TMDLs. Fecal coliforms are a subset of the total coliform group and indicate the presence of fecal material from warm-blooded animals. Total coliform bacteria generally indicate the presence of soil-associated bacteria and result from natural influences on a water body such as rainfall runoff as well as sewage inflows.

5.1 WATER QUALITY ASSESSMENT AND DEVIATION FROM TARGET

FDEP maintains ambient monitoring stations throughout the basin. All data collected at monitoring stations within the impaired WBID are used in the analysis. Table 3 provides a list of the monitoring stations. Data collected during the Group 3 listing cycle (i.e., January 1997 through June 2004) and any recent data, if available, are considered in the data assessment. Table 4 and Table 5 provide a statistical summary of the data and include the percent of samples that deviate from the target. A listing of all monitoring stations, measured concentrations, and graphics showing all data collected in the WBID with respect to the target are included in Appendix A.

Table 3. Monitoring Stations used in the Development of Coliform TMDLs

WBID	Station ID/Name	Parameter Evaluated	Available Sampling Period	Number Samples
1501A	21FLTPA25020261	Fecal Coliform	3/19/99 – 11/3/03	5
	21FLPOLKLENA RUN CREEK1		5/7/02 – 11/8/03	4
	21FLTPA 28030858148024		1/12/04	1
1580	21FLPOLKP.C. CANAL6	Total Coliform	2/11/97 - 11/15/98	10
	21FLPOLKP.C. CANAL7		6/4/97 – 12/13/98	5
	21FLTPA 25020262		3/29/99	1
1613	21FLPOLKP.C. CANAL3	Fecal Coliform	1/18/02 – 1/30/03	2
	21FLTPA 25020237		2/27/98	1
	21FLTPA 27515298138351		2/12/03 – 4/26/03	2
1623K	21FLPOLKP.C. CANAL9	Fecal Coliform	1/15/02 – 4/18/04	10
	21FLTPA 27552158149358		2/5/03 – 11/4/03	4
1871	21FLTPA 25020256	Fecal Coliform	9/16/98 – 12/16/03	10
	21FLTPA 27283758145059		2/4/03 – 12/16/03	9

Table 4. Summary of Fecal Coliform Monitoring Data

WBID	Number of Samples	30-Day Geometric Mean[1]	% Samples > 400 (MPN/100mL)	% Samples > 800 (MPN/100mL)	Minimum Concentration (MPN/100mL)	Maximum Concentration (MPN/100mL)
1501A	10	N/A	50	20	90	2600
1613	5	N/A	20	0	30	450
1623K	14	N/A	29	7	18	2500
1871	19	N/A	32	16	1	2630

Notes:
1. N/A = not applicable as less than 10 samples collected within a 30-day period to evaluate criteria.

Table 5. Summary of Total Coliform Monitoring Data

WBID	Number of Samples	30-Day Geometric Mean	% Samples > 2,400 (MPN/100mL)	Minimum Concentration (MPN/100mL)	Maximum Concentration (MPN/100mL)
1580	16	N/A	19	360	3800

Notes:
1. N/A = not applicable as less than 10 samples collected within a 30-day period to evaluate criteria.

Violations of the fecal and total coliform criteria often occur in response to rainfall events. The National Oceanic and Atmospheric Administration (NOAA) collect meteorological data at numerous locations in Florida. Precipitation data collected at stations near the impaired WBIDs are superimposed on the water quality results to identify conditions when violations are occurring. The correlation between fecal coliform measured in Saddle Creek below Hancock (WBID 1623K) and precipitation measured at a nearby NOAA station in Bartow is shown in Figure 2. The water quality violation occurred on October 8, 2003, when the measured rainfall was 1.86 inches/day. The correlations between rainfall and coliform concentrations measured in other impaired WBIDs are shown in Appendix A. A rainfall analysis was not developed for Alligator Branch (WBID 1871), as precipitation data was not readily available at the NOAA station in Hardee, Florida during the time period that the monitoring data was collected.

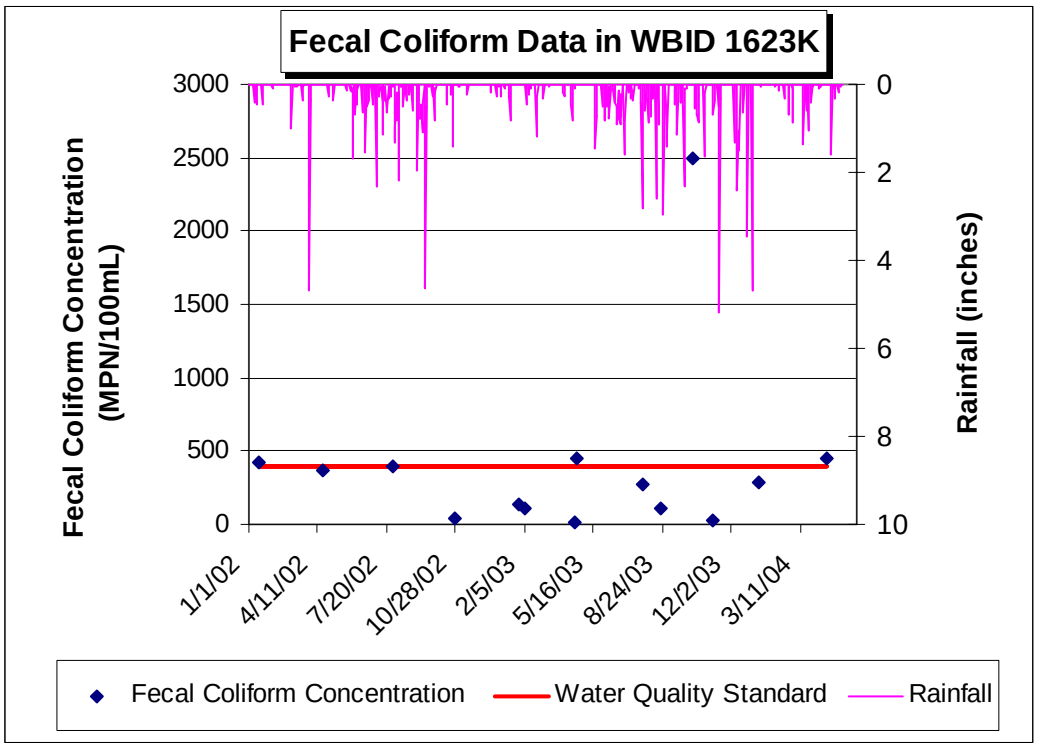

Figure 2. Fecal Coliform concentration in Saddle Creek below Hancock and Rainfall measured at Bartow, Florida (COOP: 080478)

5.2 SOURCE ASSESSMENT

An important part of the TMDL analysis is the identification of source categories, source subcategories, or individual sources of coliform bacteria in the watershed and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either point or non-point sources.

A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source discharges of industrial wastewater and treated sanitary wastewater must be authorized by National Pollutant Discharge Elimination System (NPDES) permits. NPDES permitted facilities discharging treated sanitary wastewater or stormwater (i.e., Phase I or II MS4 discharges) are considered primary point sources of coliform.

Non-point sources of coliform are diffuse sources that cannot be identified as entering a waterbody through a discrete conveyance at a single location. These sources generally, but not always, involve accumulation of bacteria on land surfaces and wash off as a result of storm events. Typical non-point sources of coliform include:

- Wildlife
- Agricultural animals
- Onsite Sewer Treatment and Disposal Systems (septic tanks)
- Urban development (outside of Phase I or II MS4 discharges)

The Watershed Characterization System (WCS), a geographic information system (GIS) tool, was used to display, analyze, and compile available information to characterize potential bacteria sources in the impaired WBIDs. This information includes land use, point source dischargers, soil types and characteristics, population data (human and livestock), and stream characteristics.

5.2.1 Point Sources

There are several point sources located in the drainage areas of the 303(d) listed stream segments that possess NPDES permits to discharge sanitary wastewater. A domestic sewage plant and an industrial facility possess NPDES permits to discharge treated wastewater to surface water, Lake Lena Run, which is listed for fecal coliform. A wasteload allocation (WLA) is given to NPDES facilities discharging to surface waters. Facilities that dispose of wastewater by means other than surface water discharge, such as through spray irrigation or underground injection wells, typically treat wastewater to less stringent secondary standards. The WBIDs located in the Peace River Basin that are within the service area of leaking collection lines could contribute to impairment, especially during wet weather events. A list of NPDES facilities impacting WBIDs in this TMDL report are provided in Table 6.

Table 6. NPDES Facilities Discharging in Watershed of the Impaired WBIDs

NPDES No.	Facility Name	Discharge Point	Flow (MGD)	Fecal Coliform Permit Limits[1]	
				Annual / Monthly Average	Daily Maximum / 7 day average
FL0021466	Auburndale STP	Lake Lena Run	1.4	200 MPN/100ml (Fecal Coliform)	800 MPN/100ml (Fecal Coliform)
FL0003051	Florida Distillers	Lake Lena Run	2.5	200 MPN/100ml (Fecal Coliform)	400 MPN/100ml (Fecal Coliform)
FLS000015	City of Winter Haven MS4	Stormwater	-	-	-
FLS000015	City of Lake Wales	Stormwater	-	-	-
FLS000015	Polk County	Stormwater	-	-	-
FLS000015	FDOT District 1	Stormwater	-	-	-

Notes:
1. Fecal coliform permit limits (200 MPN/100mL) are expressed as an average annual for Auburndale STP and an average monthly for Florida Distillers. In addition, the permit limits are expressed as a one-day maximum concentration (800 MPN/100ml) for Auburndale STP and a 7-day average (400 MPN/100mL) for Florida Distillers.

A query of EPA's Permit Compliance System (PCS) database (www.epa.gov/envir) indicates that the two facilities, Auburndale STP and Florida Distiller, did not report any permit violations. Based on this information, effluent discharging from the facilities does not appear to cause or

contribute to the fecal coliform impairment in the listed waterbody. The coliform wasteload allocations are calculated as both an annual average load for Auburndale STP and a monthly average load for Florida Distiller using the facilities design flow and permit concentrations. The WLA expressed as MPN/day represents the maximum load the facilities can discharge on any one day during a 30 day period. A footnote to Table 12 expresses the WLA for Auburndale STP in terms of a daily maximum and for Florida Distillers in terms of a 7 day average. The WLA is calculated using Equation 1.

WLA = Flow × Concentration × Conversion factor (Equation 1)
Where: flow = mgd
Concentration = 800 MPN/100ml (fecal daily max); 200 MPN/100ml (fecal monthly average)
Conversion factor = (10^6 gal × 3.785 L/gal × 1000 ml/L) / 100 ml = 3.785 x 10^7

Municipal Separate Storm Sewer Systems (MS4s) may also discharge bacteria to waterbodies in response to storm events. Currently, large and medium MS4s serving populations greater than 100,000 people are required to obtain a NPDES storm water permit. In March 2003, small MS4s serving urbanized areas will be required to obtain a permit under the Phase II storm water regulations. An urbanized area is defined as an entity with a residential population of at least 50,000 people and an overall population density of 1,000 people per square mile.

The City of Lake Wales (FLS000015) and the City Winter Haven (FLS000015) are included in the Polk County NPDES Phase1 MS4 permit. The City of Lake Wales and City of Winter Haven may discharge into the drainage basin of Peace Creek Tributary Canal and Wahneta Farms Drain Canal, respectively. All waterbodies located within Polk County that collect or receive storm water discharges from regulated Phase I MS4 areas are subject to the appropriate provisions of the NPDES Phase1 MS4 permit. Polk County is the lead applicant in the permit, and is responsible for the coordination of information and efforts to be reported in the annual reports. Additionally, via interlocal agreements and Memorandum of Agreements, Polk County may be responsible for the actual implementation of stormwater requirements as stated in the permit. However, each permittee covered in the permit is ultimately responsible for the MS4 discharges resulting from their jurisdiction, including TMDLs and WLAs.

The WLA for the MS4 is expressed in terms of percent reduction. Given the available data, it is not possible to estimate loadings in units of MPN/day coming exclusively from the MS4 area. Although the aggregate wasteload allocation for storm water discharges is expressed in numeric form, percent reduction, based on the information available today, it is infeasible to calculate numeric WLAs for individual storm water outfalls because discharges from these sources can be highly intermittent, are usually characterized by very high flows occurring over relatively short time intervals, and carry a variety of pollutants whose nature and extent varies according to geography and local land use. For example, municipal sources such as those covered by these TMDLs often include numerous individual outfalls spread over large areas. Water quality impacts, in turn, also depend on a wide range of factors, including the magnitude and duration of rainfall events, the time period between events, soil conditions, fraction of land that is impervious to rainfall, other land use activities, and the ratio of storm water discharge to receiving water flow.

These TMDLs assume for the reasons stated above that it is infeasible to calculate numeric water quality-based effluent limitations for coliform for storm water discharges. Therefore, in the absence of information presented to the permitting authority showing otherwise, these TMDLs

assume that water quality-based effluent limitations for storm water sources of coliforms derived from this TMDL can be expressed in narrative form (e.g., as best management practices), provided that (1) the permitting authority explains in the permit fact sheet the reasons it expects the chosen BMPs to achieve the aggregate wasteload allocation for these storm water discharges; and (2) the state will perform ambient water quality monitoring for coliform expressed as MPN/day for the purpose of determining whether the BMPs in fact are achieving such aggregate wasteload allocation.

The percent reduction calculated for nonpoint sources is assigned to the MS4 as violations from both sources typically occur in response to storm events. Permitted MS4s will be responsible for reducing only the loads associated with stormwater outfalls which it owns, manages, or otherwise has responsible control. MS4s are not responsible for reducing other nonpoint source loads within its jurisdiction. All future MS4s permitted in the area are automatically prescribed a WLA equivalent to the percent reduction assigned to the LA. A WLA is given for both fecal and total coliform as reasonable potential exists for the MS4 to discharge both of these parameters.

5.2.2 Non-point Sources

5.2.2.1 Wildlife

Wildlife deposit bacteria in their feces onto land surfaces where it can be transported during storm events to nearby streams. Bacteria load from wildlife is assumed background, as the contribution from this source is small relative to the load from urban and agricultural areas. Water fowl (e.g., egrets, ducks, wood storks, herons) often frequent stormwater ponds. Depending on the number of birds, the contributions of fecal coliform could result in instream concentrations above criteria.

5.2.2.2 Agricultural Animals

Agricultural animals are the source of several types of coliform loadings to streams, which impact water quality. This source includes agriculture runoff from pastureland and cattle in streams. Most of the waterbodies listed for fecal coliform are located in highly agriculture areas, thus agriculture and livestock are a relevant source of impairment. Cumulatively, the land use within the impaired waterbodies is more than 50 percent agricultural.

The USDA National Agricultural Statistics Service (NASS) compiles Census of Agriculture data by county for virtually every facet of U.S. agriculture (USDA, 2002). The “Census of Agriculture Act of 1997” (Title 7, United States Code, Section 2204g) directs the Secretary of Agriculture to conduct a census of agriculture on a 5-year cycle collecting data for the years ending in 2 and 7. Livestock inventory from the 1997 and 2002 Census of Agriculture reports for Flagler County are listed in Table 7. As shown in this table, cattle and beef cows are the predominate livestock. Confined Animal Feeding Operations (CAFOs) are not known to operate in either Polk or Hardee County.

In 2002, NASS reported 1,142 farms in Hardee County, which covers an area of 346,191 acres. In Polk County, the 2002 NASS reported 3,114 farms, which cover an area of 626,634 acres. The average size farm in Hardee County in 2002 was 303 acres. The average size farm in Polk County was 201 acres. The predominate livestock in these counties are cattle, including beef

and dairy cows. There was no available information with regards to the sheep inventory in Hardee County.

Table 7. Livestock Inventory by County (source: NASS, 2002)

Livestock (inventory)	Hardee	Polk
Cattle and calves	94,749	108,126
Beef Cows	57,071	70,555
Dairy Cows	8,757	888
Horses and Ponies	713	2,562
Poultry (broilers sold)	123	144
Sheep	-	125

5.2.2.3 Onsite Sewerage Treatment and Disposal Systems (Septic Tanks)

Onsite sewage treatment and disposal systems (OSTDs) including septic tanks are commonly used where providing central sewer is not cost effective or practical. When properly sited, designed, constructed, maintained, and operated, OSTDs are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTD is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, OSTDs can be a source of nutrient (nitrogen and phosphorus), pathogens, and other pollutants to both ground water and surface water. The State of Florida Department of Health (www.doh.state.fl.us/environment/statistics) publishes septic tanks data on a county basis. Table 8 summarizes the cumulative number of septic systems installed since the 1970 census and the total number of repair permits issued between 1991 and 2004. The data does not reflect septic tanks removed from service.

Table 8. County Estimates of Septic Tanks and Repair Permits (FDEP, 2004)

County	Number Septic Tanks (1970- 2002)	Number of Repair Permits Issued (1996 – 2002)
Hardee	8,293	33
Polk	112,848	1299

5.2.2.4 Urban Development

Fecal coliform loading from urban areas is attributable to multiple sources including storm water 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.

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 outlined in Chapter 403 Florida Statutes (F.S.), was established as a technology-based program that relies upon 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.
Florida's stormwater program is unique in having a performance standard for older stormwater systems that were built before the implementation of the Stormwater Rule in 1982. This rule states: "the pollutant loading from older stormwater management systems shall be reduced as needed to restore or maintain the beneficial uses of water" (Section 62-4-.432 (5) (c), F.A.C.).

Nonstructural and structural BMPs are an integral part of the State's stormwater programs. Nonstructural BMPs, often referred to as "source controls", are those that can be used to prevent the generation of NPS pollutants or to limit their transport off-site. Typical nonstructural BMPs include public education, land use management, preservation of wetlands and floodplains, and minimizing impervious surfaces. Technology-based structural BMPs are used to mitigate the increased stormwater peak discharge rate, volume, and pollutant loadings that accompany urbanization.

5.3 Analytical Approach

The approach for calculating coliform TMDLs depends on the number of water quality samples and the availability of flow data. When long-term records of water quality and flow data are not available, the TMDL is expressed as a percent reduction. Load duration curves are used to develop TMDLs when significant data are available to develop a relationship between flow and concentration. Load duration curves utilize a mass balance approach to estimate loadings transported in the stream. For the load duration curve TMDLs, the target is the acute criteria. The approach used to develop the coliform TMDLs are listed in Table 9. The target in the coliform TMDLs is the acute water quality standard.

Table 9. Approach for developing coliform TMDLs

Listed Waterbody/WBID	Parameter	Approach
Lake Lena Run (1501A)	Fecal Coliform	Percent Reduction
Wahneta Farms Drain Canal (1580)	Total Coliform	Percent Reduction
Peace Creek Tributary Canal (1613)	Fecal Coliform	Load Duration Curve
Saddle Creek below Hancock (1623K)	Fecal Coliform	Percent Reduction
Alligator Branch (1871)	Fecal Coliform	Percent Reduction

5.3.1 Percent Reduction Approach for TMDL Development

The "percent reduction" methodology was used to express the TMDL for the majority of the WBIDs. Under this method, the percent reduction needed to meet the applicable criterion is calculated based on the 90th percentile of all measured concentrations. The 90th percentile concentration implies 90 percent of the measured values are lower than this concentration or 10 percent are higher. The 90th percentile concentration represents existing conditions. The percent reduction required to meet the coliform criteria is based on the following equation:

Percent Reduction = (existing concentration – criteria) / existing concentration × 100 (Equation 2)

Fecal coliform concentrations measured in Saddle Creek below Hancock (WBID 1623K), the calculated 90th percentile concentration and percent reduction required to meet the acute criterion is shown in Table 10. The 90th percentile concentration is 450 MPN/100ml and an 11 percent reduction is necessary to meet the instream water quality target of 400 MPN/100 ml. Calculations for the other WBIDs listed in Table 9 are provided in Appendix A.

Table 10. Fecal Coliform Measurements in Saddle Creek below Hancock (WBID 1623K)

Station	Date	Concentration (MPN/100ml)
21FLPOLKP.C. CANAL9	1/15/2002	420
21FLPOLKP.C. CANAL9	4/17/2002	370
21FLPOLKP.C. CANAL9	7/27/2002	390
21FLPOLKP.C. CANAL9	10/26/2002	45
21FLPOLKP.C. CANAL9	1/28/2003	136
21FLTPA 27552158149358	2/5/2003	110
21FLPOLKP.C. CANAL9	4/19/2003	18
21FLTPA 27552158149358	4/22/2003	450
21FLPOLKP.C. CANAL9	7/26/2003	270
21FLTPA 27552158149358	8/22/2003	110
21FLPOLKP.C. CANAL9	10/8/2003	2500
21FLTPA 27552158149358	11/4/2003	25
21FLPOLKP.C. CANAL9	1/10/2004	290
21FLPOLKP.C. CANAL9	4/18/2004	450
90th Percentile Concentration		**450**
Percent Reduction		**11.11%**

5.3.2 Mass Balance Approach for TMDL Development

Load duration curves are based on the conservation of mass principle as defined previously in Equation 1.

$$\text{Load} = \text{Concentration} \times \text{Flow} \times \text{Conversion Factor} \qquad \text{(Equation 1)}$$

Where: Load = MPN/day
Flow = cfs
Concentration = MPN/100mL
Conversion Factor = (28.247 L/cf × 86400 sec/day × 1000mL/L)/100mL

For existing conditions, the sample concentration and an estimate of flow on the day of sampling is used to calculate the load. The allowable load, or TMDL, is calculated using the applicable water quality criterion. If a USGS flow gage operates in the WBID a flow duration curve is developed and the flow at various duration intervals is used to estimate the allowable load. All of the waterbodies discussed in this report are ungaged streams. There are various methods available to estimate flows on ungaged streams. Flows on ungaged streams can be extrapolated by using the measured flows from a nearby gaged stream and using a drainage area ratio or some type of regression analysis. Flows for Peace Creek Tributary Canal were estimated by multiplying the weighted drainage area ratio by the flows measured at the gage on Peace Creek Drainage Canal. Flows were not estimated for the other waterbodies discussed in the report as gaged reference streams of similar drainage size and landuse characteristics were not available.

5.3.3 Flow Duration Curves

The first step in developing load duration curves is to create flow duration curves. A flow duration curve displays the cumulative frequency distribution of daily flow data over the period of record. The curve relates flows measured at a monitoring station to a duration interval representing the percent of time flows are equaled or exceeded. Flows are ranked from low, which are exceeded nearly 100 percent of the time, to high, which are exceeded less than 1 percent of the time. Flow duration curves are limited to the period of record available at a gage. The confidence in the duration curve approach in predicting realistic percent load reductions increases when longer periods of record are used to generate the curves. The flow duration curve for Peace Creek Tributary Canal (WBID 1613) is shown in Figure 4 and is based on the USGS gage, Peace Creek Drainage Canal near Wahneta, Florida (USGS 02293987).

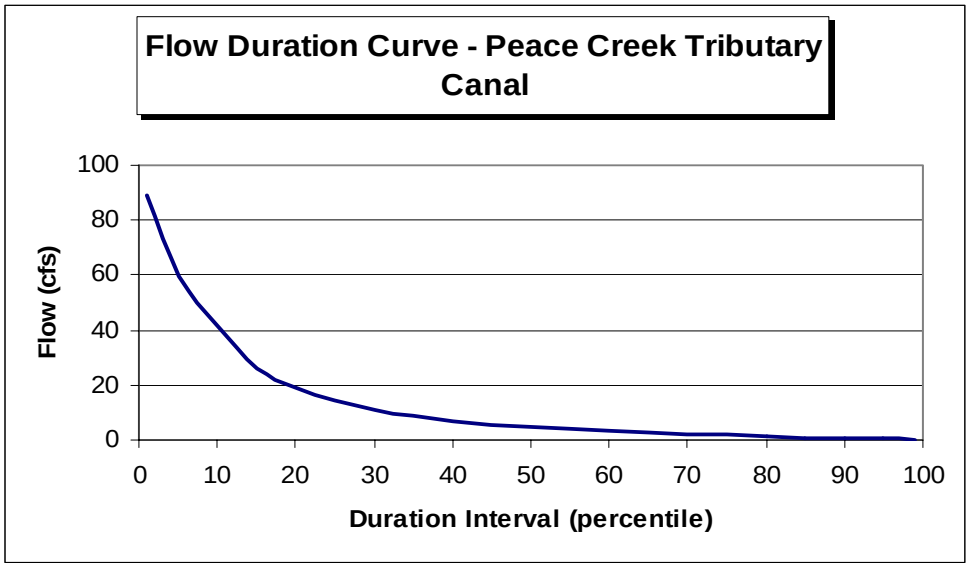

Figure 3. Flow Duration Curve for Peace Creek Tributary Canal (USGS 02293987)

5.3.4 Load Duration Curves

The load duration curve is a visual display of the existing and allowable loads at each interval on the flow duration curve. The load duration curve developed for fecal coliform in Peace Creek Tributary Canal (WBID 1613) is shown in Figure 4. The existing loads are based on the instream coliform concentrations measured during ambient monitoring and an estimate of flow at the station. The existing load for Peace Creek Tributary Canal (WBID 1613) is 3.59×10^{10} MPN/day. Allowable loads, or TMDL, are based on the flow values at each interval on the flow duration curve and the applicable water quality criterion. The allowable/target load for Peace Creek Tributary Canal (WBID 1613) is 3.06×10^{10} MPN/day, which requires a 15 percent reduction from the existing load. Because insufficient data were collected to evaluate either the chronic criteria (i.e., geometric mean), the more stringent of the acute criteria (i.e., not to exceed percentage) is the target criterion in the fecal coliform TMDLs. Using the absolute value of the not to exceed criteria allows for an implicit margin of safety in the TMDLs.

The water quality samples collected at a monitoring station are separated into two groups depending on whether they violate the numerical target. Using Equation 1 (see Section 5.3.2) loads are calculated for each sample using the flow estimated or measured on the sampling day. Loads are expressed in units of counts per day to reflect the instantaneous criterion. The two groups of loads are plotted on the load duration curve with unique symbols. The positioning of the loads on the curve is based on the duration interval of the stream flow. Loads positioned above the allowable load line represent violations of the criterion while loads positioned below the line represent compliance with the criterion.

The positioning of monitoring data on the load duration curve provides an indication of the potential sources and delivery mechanisms of the pollutant. In general, violations occurring on the right side of the curve typically occur during low flow events and are indicative of continuous pollutant sources, such as NPDES permitted discharges, leaking collection lines, or leaking septic systems. Livestock having access to streams could also be a source during low flow (livestock are not expected to be in the stream during high flows). Violations that occur on the left side of the curve occur during high flow events. Violations in this range are indicative of sources responding to rainfall events. As shown in Figure 4, the water quality violation occurs during moist conditions (i.e., flows exceeded between 40 and 60 percent of time) in response to or after rainfall events.

Duration curve intervals can be grouped into broad categories, or zones, in order to provide insight about conditions and patterns associated with the impairment (Cleland, 2003). The use of duration curve zones provides a method for communicating technical information in a way that easily conveys conditions associated with problems. In the Peace Creek Drainage Canal TMDL, the load duration curve was not divided into zones due to the insufficient number of samples.

If a sufficient number of samples plot above the allowable load line (i.e., more than five points),

a trendline is drawn through the data violations. In the load curve application, trend lines are used to predict the load at other duration intervals. The type of line drawn through the data can have several shapes, ranging from linear (simplest form) to moving average. The type of the line chosen should result in a relatively high correlation factor, denoted by the variable R^2. The correlation factor provides an indication of how well the equation of the line represents the data. In general, high correlation factors are not associated with environmental data. A trendline was not drawn through the Peace Creek Tributary Canal data as fewer than five measurements represented violations of the water quality criteria.

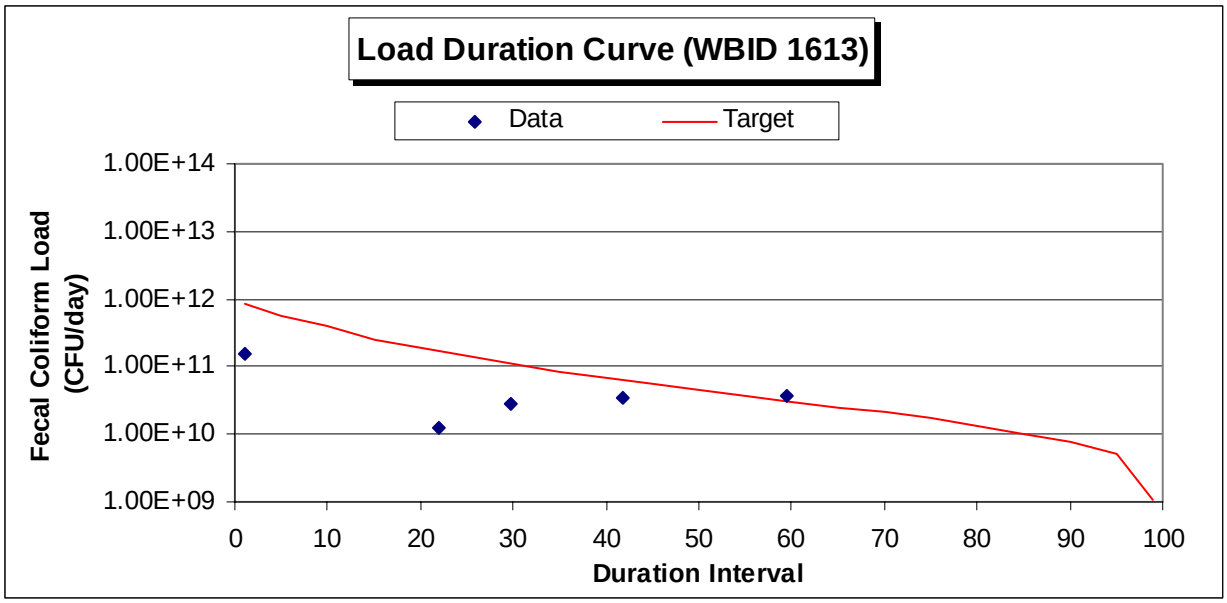

Figure 4. Load duration curve for fecal coliform in Peace Creek Tributary Canal (WBID 1613)

5.4 Development of Total Maximum Daily Loads

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on the relationship between pollution sources and in-stream water quality conditions. A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations), non-point source loads (Load Allocations), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$TMDL = \Sigma WLAs + \Sigma LAs + MOS$$

The objective of a TMDL is to allocate loads among all of the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time (e.g. pounds per day), toxicity, or other appropriate measure. TMDLs for the

impaired waterbodies are expressed in terms of a percent reduction, and where possible, as loads in units of counts per day. When expressed as a load, the TMDL value represents the maximum one-day load the stream can transport over a 30-day period and maintain the water quality standards.

5.4.1 Critical Conditions

The critical condition for non-point source coliform loading is an extended dry period followed by a rainfall runoff event. During the dry weather period, coliforms build up on the land surface, and are washed off by rainfall. The critical condition for point source loading occurs during periods of low stream flow when dilution is minimized. Water quality data have been collected during both time periods. Most violations occur during median to high flow conditions.

Critical conditions are accounted for in the analyses by using the entire period of record of measured flows (when available) and all water quality data available during the listing cycle for the stream. In the load duration method, the critical condition is defined as the zone requiring the largest reduction. However, zones were not applicable since there was one exceedance in Peace Creek Tributary Canal. By achieving the reduction of the exceedance, the water quality standard should be achieved during all periods of flow.

5.4.2 Existing Conditions

Existing conditions are based on the instream water quality violations. For TMDLs developed using the load duration curve method, the existing load is based on the average values of the violations occurring in each zone or category. For Peace Creek Tributary Canal, load duration curve zones were not developed due to the insufficient number of samples violating the water quality criterion. Thus, the existing condition for Peace Creek Tributary Canal was based on the instream water quality violation of 450 MPN/ 100mL, which requires an 11 percent reduction to meet the fecal coliform water quality standard.

Existing conditions for TMDLs developed using the percent reduction method are expressed in terms of the 90th percentile concentration exceeding the applicable coliform criteria. This is considered an appropriate method for estimating existing conditions as flow at the time of sampling was not available for calculating loads. Existing conditions for the impaired WBIDs covered in this report are shown in Table 11.

Table 11. Existing Conditions for Impaired WBIDs in Upper and Middle Peace River Basins

WBID	Waterbody	90th Percentile Concentration (MPN/100ml)
Fecal Coliform		
1501A	Lake Lena Run	1160
1623K	Saddle Creek below Hancock	450
1871	Alligator Branch	1093
Total Coliform		
1580	Wahneta Farms Drain Canal	2800

5.5 Margin of Safety

There are two methods for incorporating a MOS in the analysis: a) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or b) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. In the Peace River Basin TMDLs, an implicit MOS was used. The load duration approach uses violations of water quality criteria to estimate existing loads, which is the basis for the percent reduction necessary to achieve standards. In the percent reduction approach, the 90th percentile concentration is considered conservative as this concentration is exceeded in less than 10 percent of the samples. This approach is consistent with EPA's listing guidance, which allows criteria to be exceeded in less than 10 percent of the samples.

5.6. Determination of TMDL, LA and WLA

The TMDL values represent the maximum daily load the stream can assimilate and maintain water quality standards. The TMDLs are based on the one-day maximum concentration of the parameter as specified in the Class III WQS and are expressed in units of MPN per day. The TMDL value is reduced by the WLA, if any, to obtain the LA component. TMDL components for the impaired waterbodies as well as the percent reduction required to achieve the numerical criterion are summarized in Table 12.

Table 12. Summary of TMDL Components

Stream Name / WBID	Parameter	WLA[1]		LA	TMDL[3]	Percent Reduction[4]
		Continuous (MPN/day)[5]	MS4 (reduction)			
Lake Lena Run (1501A)	Fecal Coliform	2.95×10^{10} (see note 6)	N/A[2]	66% (reduction)	66% (reduction)	66%
Wahneta Farms Drain Canal (1580)	Total Coliform	N/A	14% (reduction)	14% (reduction)	14% (reduction)	14%
Peace Creek Tributary Canal (1613)	Fecal Coliform	N/A	11% (reduction)	3.06×10^{10} MPN/day	3.06×10^{10} MPN/day	11%
Saddle Creek above Lake Hancock (1623K)	Fecal Coliform	N/A	N/A	11% (reduction)	11% (reduction)	11%
Alligator Branch (1871)	Fecal Coliform	N/A	63% (reduction)	63% (reduction)	63% (reduction)	63%

Notes:

1. WLA component separated into load from continuous NPDES facilities (e.g., WWTP) and load from MS4. Continuous discharge facilities have WLA units of MPN/day based on permit limits and design flow. MS4 load represented as percent reduction. If future residential development densities result in a change to the MS4 boundary, the MS4 will be required to meet the established TMDL in the form of BMPs.
2. N/A = not applicable
3. Margin of Safety is implicit and does not contribute to the TMDL value.
4. Overall reduction to achieve the acute criteria for fecal coliform of 400 MPN/100ml and 2400

MPN/100ml for total coliform.

5. Flow data not available. TMDL represents average percent reduction from samples collected
6. The WLA as presented in this Table is the cumulative WLA from Auburndale STP and Florida Distillers, which is based on 200 MPN/100mL permit limits for average annual and average monthly, respectively.

5.6.1 Waste Load Allocations

Of the WBIDs addressed in this report, only Lake Lena Run (WBID1501A) has NPDES facilities discharging directly into the stream. A domestic sewage plant (Auburndale STP) and an industrial facility (Florida Distillers) possess a NPDES permits to discharge treated wastewater to surface waters in Lake Lena Run (WBID 1501A) watershed. The continuous loads into Lake Lena Run (WBID 1501A) cannot cumulatively exceed 2.95×10^{10} MPN/100mL based on the 200 count/100mL permit limits. The Auburndale STP cannot exceed 1.06×10^{10} MPN/day and the Florida Distiller cannot exceed 1.89×10^{10} MPN/day based on the 200 MPN/100mL permit limit average annual and 30 day average, respectively. The Auburndale STP cannot exceed 4.24×10^{10} MPN/day based on the daily maximum permit limit of 800 MPN/100mL. The Florida Distiller cannot exceed 3.79×10^{10} MPN/day based on the 7 day permit limit of 400 MPN/100mL.

Only facilities discharging directly into streams and MS4 areas are assigned a WLA. The WLAs are expressed separately for continuous discharge facilities (e.g., sewage treatment plants) and MS4 areas as the former discharges during all weather conditions whereas the later discharges in response to storm events. Any future facility permitted to discharge coliform bacteria to surface waters in the impaired WBIDs will be required to meet end-of-pipe standards. Future facilities discharging at concentrations less than standard should not cause or contribute coliform bacteria impairment in the watershed.

The City of Lake Wales, City Winter Haven, Polk County, and FDOT District 1 are covered by a Phase I MS4 permit, FLS000015 that may discharge into the drainage basin of Peace Creek Tributary Canal and Wahneta Farms Drain Canal. The WLA assigned to the MS4 area is expressed in terms of percent reduction of coliform concentration required to attain standards. With the available water quality data it is not possible to isolate the loading discharging exclusively from the MS4 areas. Any future MS4 located within the watershed boundaries of the impaired WBIDs will be prescribed a WLA based on the percent reduction required in the TMDL.

5.6.2 Load Allocations

There are two modes of transport for non-point source coliform bacteria loading into the stream. First, fecal coliform loading from failing septic systems and animals in the stream are considered direct sources of coliform to the stream, as they are independent of precipitation. The second mode involves coliform loadings resulting from accumulation on land surfaces transported to streams during storm events. Total coliform concentrations are likely elevated due to the second mode of transport.

The positioning of the water quality data values on the load duration curve provide an indication of the mode of transport occurring during periods of violations. If the water quality violations in the impaired WBIDs are distributed on the left side of the curve, it is likely the violations occur in

response to wet weather events. Rainfall data collected near the impaired WBIDs also provides insight of the conditions and mode of transport occurring during periods of violations. Wet weather conditions are associated with most coliform violations (see Appendix A).

5.7. Seasonal Variation

Seasonal variation was incorporated in the load curves by using the entire period of record of flow recorded at the gages. Seasonality was also addressed by using all water quality data associated with the impaired WBIDs, which was collected during multiple seasons.

5.8. Recommendations

Determining the source of bacteria in waterbodies is the initial step to implementing a coliform TMDL. FDEP employs the Basin Management Action Plan (B-MAP) as the mechanism for developing strategies to accomplish the necessary load reductions. Components of a B-MAP are:

- Allocations among stakeholders
- Listing of specific activities to achieve reductions
- Project initiation and completion timeliness
- Identification of funding opportunities
- Agreements
- Local ordinances
- Local water quality standards and permits
- Follow-up monitoring

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APPENDIX A WATER QUALITY DATA

Table 13. Guide to Water Quality Remark Codes (Rcode column in data tables)

Remark Code	Definition	Use in TMDL
A	Value reported is mean of two or more samples	Data included in analysis as reported
B	Result based on colony counts outside the acceptable range	Data included in analysis as reported
E	Extra sample taken in compositing process	Data included as average
I	The value reported is less than the practical quantification limit and greater than or equal to the method detection limit.	Data included in analysis as reported
K	Off-scale low. Actual value not known, but known to be less than value shown	Data included in analysis as reported
L	Off-scale high. Actual value not known, but known to be greater than value shown	Data included in analysis as reported
Q	Sample held beyond normal holding time	Data used in analysis – holding samples on ice slows the metabolism of the organisms resulting in no appreciable growth. Actual concentration is expected to be at least as high as the value reported.
T	Value reported is less than the criteria of detection	Data included in analysis if the reported value is below criteria; otherwise, reported value is not used in the analysis
U	Material was analyzed for but not detected. Value stored is the limit of detection.	Data not included in analysis
<	NAWQA – actual value is known to be less than the value shown	Data included in analysis
Z	Too many colonies were present to count (TNTC), the numeric value represents the filtration volume	Data not included in analysis

Table 14. Fecal Coliform measurements collected in Lake Lena Run (WBID 1501A)

Date	wbid	sta	time	depth	result
3/19/99	1501A	21FLTPA 25020261	815	0.10	660
5/7/02	1501A	21FLPOLKLENA RUN CREEK1	1345	0.15	500
11/22/02	1501A	21FLPOLKLENA RUN CREEK1	855	0.20	1000
2/5/03	1501A	21FLTPA 25020261	1015	0.20	130
5/6/03	1501A	21FLTPA 25020261	1100	0.20	150
5/19/03	1501A	21FLPOLKLENA RUN CREEK1	1020	0.09	2600
8/19/03	1501A	21FLTPA 25020261	1015	0.20	670
11/3/03	1501A	21FLTPA 25020261	1125	0.20	380
11/8/03	1501A	21FLPOLKLENA RUN CREEK1	845	0.30	150
1/12/04	1501A	21FLTPA 28030858148024	1035	0.20	90
		90th Percentile Concentration of all Measurements:			1160
			Percent Reduction:		65.52

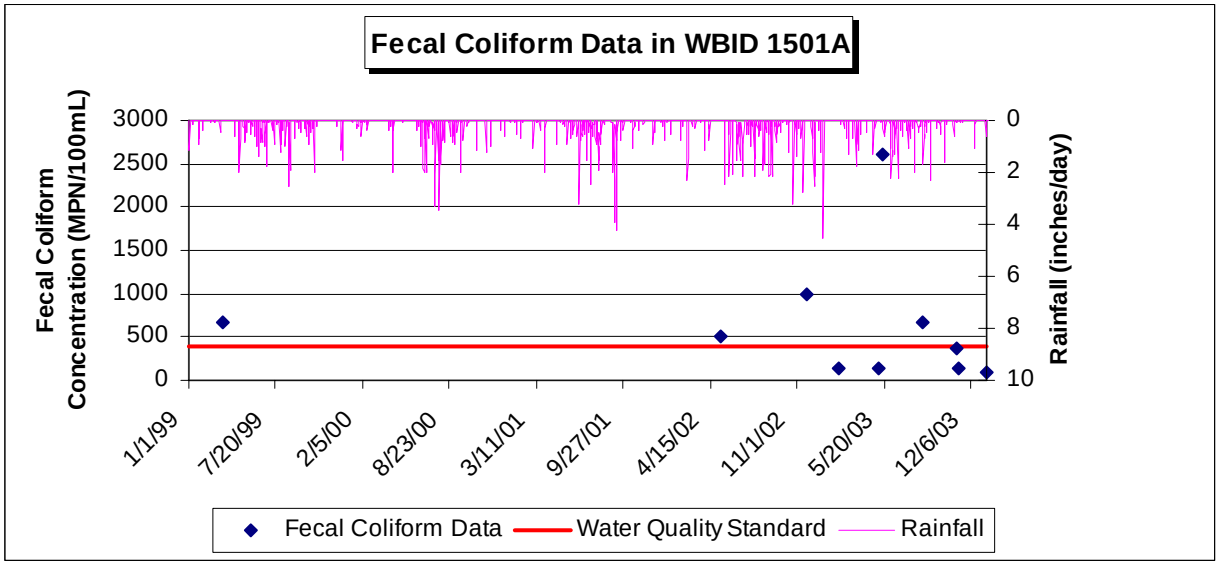

Figure 5: Fecal coliform measurements in Lake Lena Run and rainfall collected at Winter Haven, Florida (COOP: 089707)

Table 15: Total Coliform measurements collected in Wahneta Farms Drain Canal (WBID 1580)

Date	wbid	Station	Time	Depth	Result	rcode
2/11/97	1580	21FLPOLKP.C. CANAL6	1115	0.66	450	
5/19/97	1580	21FLPOLKP.C. CANAL6	1100	0.33	1980	
6/4/97	1580	21FLPOLKP.C. CANAL7	1250	0.98	900	
8/13/97	1580	21FLPOLKP.C. CANAL6	1040	0.98	360	
11/5/97	1580	21FLPOLKP.C. CANAL6	1030	2.30	2250	
12/4/97	1580	21FLPOLKP.C. CANAL7	900	1.31	1400	
2/10/98	1580	21FLPOLKP.C. CANAL6	1103	1.20	810	
2/10/98	1580	21FLPOLKP.C. CANAL6	1103	3.94	810	
5/13/98	1580	21FLPOLKP.C. CANAL6	1005	0.98	1620	
5/13/98	1580	21FLPOLKP.C. CANAL6	1005	0.30	1620	
6/6/98	1580	21FLPOLKP.C. CANAL7	810	0.66	2800	
6/6/98	1580	21FLPOLKP.C. CANAL7	810	0.20	2800	
8/10/98	1580	21FLPOLKP.C. CANAL6	1030	1.31	1440	
11/15/98	1580	21FLPOLKP.C. CANAL6	955	1.31	1800	
12/13/98	1580	21FLPOLKP.C. CANAL7	935	0.66	990	
3/29/99	1580	21FLTPA 25020262	1020	0.10	3800	
		90th Percentile Concentration of all Measurements:				2800
				Percent Reduction:		14.29

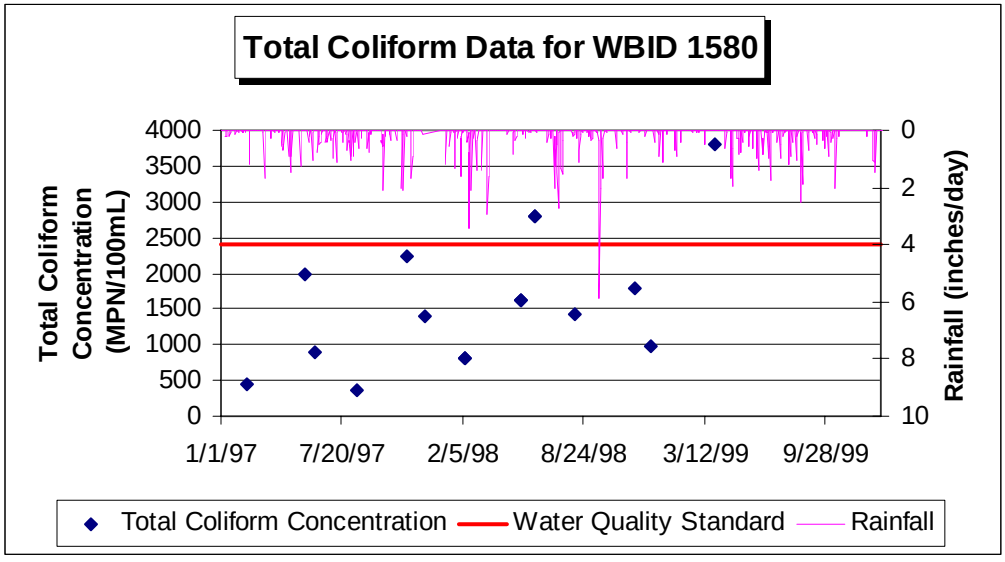

Figure 6. Total Coliform Measurements in Wahneta Farms Drain Canal and rainfall collected at Winter Haven, Florida (COOP: 089707)

Table 16. Fecal Coliform measurements collected in Alligator Branch (WBID 1871)

Date	wbid	Station	Time	Depth	Result	rcode
7/22/03	1871	21FLTPA 25020256	1015	0.10	205	
9/16/98	1871	21FLTPA 25020256	1030	0.10	1464	
9/11/03	1871	21FLTPA 25020256	940	0.20	310	
12/16/03	1871	21FLTPA 25020256	1025	0.20	700	
5/9/03	1871	21FLTPA 25020256	835	0.10	55	K
8/25/03	1871	21FLTPA 25020256	1040	0.30	280	
10/6/03	1871	21FLTPA 25020256	1215	0.20	115	
11/4/03	1871	21FLTPA 25020256	1100	0.20	480	
6/3/03	1871	21FLTPA 25020256	1210	0.20	55	K
2/4/03	1871	21FLTPA 25020256	1130	0.10	200	K
12/16/03	1871	21FLTPA 27283758145059	1045	0.20	610	
9/11/03	1871	21FLTPA 27283758145059	920	0.20	10	
2/4/03	1871	21FLTPA 27283758145059	1030	0.10	1	K
10/6/03	1871	21FLTPA 27283758145059	1155	0.20	10	
8/25/03	1871	21FLTPA 27283758145059	1105	0.30	1000	
6/3/03	1871	21FLTPA 27283758145059	1140	0.10	1	Z
5/6/03	1871	21FLTPA 27283758145059	1140	0.10	130	
11/4/03	1871	21FLTPA 27283758145059	1130	0.05	2630	
7/25/03	1871	21FLTPA 27283758145059	955	0.10	215	
		90th Percentile Concentration of all Measurements:				1092.8
				Percent Reduction:		63.4

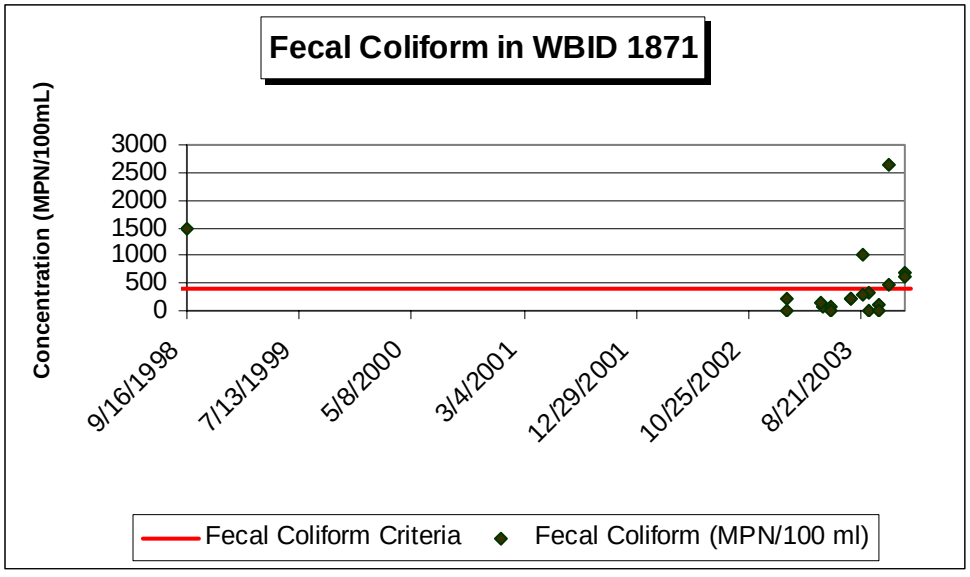

Figure 7. Fecal coliform measurements collected in Alligator Branch (WBID 1871)

Table 17. Fecal Coliform measurements in Saddle Creek below Hancock (WBID1623K)

Date	wbid	Station	Time	Depth	Result	rcode
1/15/02	1623K	21FLPOLKP.C. CANAL9	1145	0.33	420	E
4/17/02	1623K	21FLPOLKP.C. CANAL9	1055	0.15	370	
7/27/02	1623K	21FLPOLKP.C. CANAL9	930	0.50	390	
10/26/02	1623K	21FLPOLKP.C. CANAL9	930	0.30	45	
1/28/03	1623K	21FLPOLKP.C. CANAL9	1005	0.50	136	
2/5/03	1623K	21FLTPA 27552158149358	1345	0.20	110	K
4/19/03	1623K	21FLPOLKP.C. CANAL9	930	0.50	18	
4/22/03	1623K	21FLTPA 27552158149358	1000	0.20	450	
7/26/03	1623K	21FLPOLKP.C. CANAL9	915	0.50	270	
8/22/03	1623K	21FLTPA 27552158149358	950	0.20	110	
10/8/03	1623K	21FLPOLKP.C. CANAL9	1020	0.50	2500	
11/4/03	1623K	21FLTPA 27552158149358	1145	0.20	25	
1/10/04	1623K	21FLPOLKP.C. CANAL9	940	0.40	290	
4/18/04	1623K	21FLPOLKP.C. CANAL9	955	0.25	450	
		90th Percentile Concentration of all Measurements:				450
				Percent Reduction:		11.11

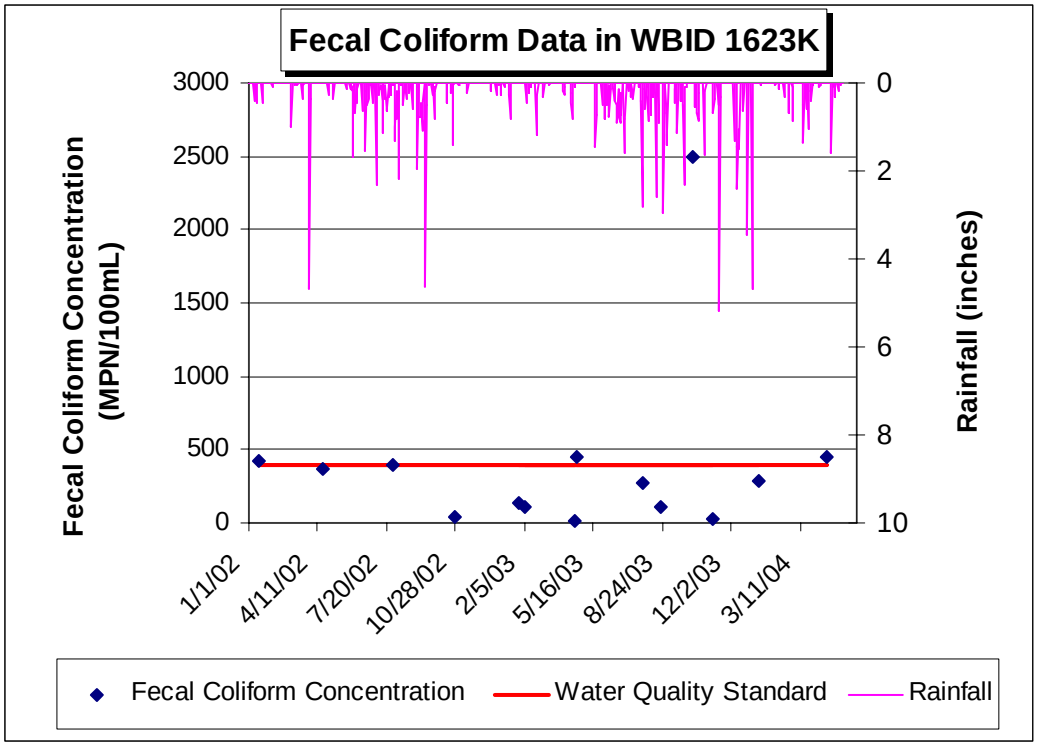

Figure 8. Fecal Coliform concentrations in Saddle Creek below Hancock and rainfall collected at Bartow, Florida (COOP: 080478) (WBID 1623K)

Table 18. Fecal Coliform measurements in Peace Creek Tributary Canal

Date	wbid	Station	Time	Depth	Result	rcode
1/30/2003	1613	21FLPOLKP.C. CANAL3	830	0.15	30	
1/18/2002	1613	21FLPOLKP.C. CANAL3	820	0.10	450	E
2/27/1998	1613	21FLTPA 25020237	959	0.33	72	
4/26/2003	1613	21FLTPA 27515298138351	915	0.20	220	
2/12/2003	1613	21FLTPA 27515298138351	1130	0.10	100	K
		90th Percentile Concentration of all Measurements:				450
				Percent Reduction:		11