FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

Total Maximum Daily Load For Fecal Coliform Bacteria for Sweetwater Branch, Alachua County, Florida

WBID 2711

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Watershed Assessment Section
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1.0 INTRODUCTION

1.1 Purpose of Report

This report presents a Total Maximum Daily Load (TMDL) for Fecal Coliforms for Sweetwater Branch. Using the methodology to identify and verify water quality impairments described in the Impaired Waters Rule (IWR), Chapter 62-303, Florida Administrative Code (FAC), the creek was verified as impaired by Fecal Coliforms, and was included on the verified list of impaired waters for the Ocklawaha Basin that was adopted by Secretarial Order on August 28, 2002. The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the source of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on a relationship between pollution sources and in-stream water quality conditions.

1.2 Identification of Waterbody

Sweetwater Branch is an urban creek that flows through the City of Gainesville, in the Orange Creek planning unit of the Ocklawaha River basin (**Figure 1**). The Orange Creek Planning Unit contains many creeks and lakes in an area of approximately 602 square miles. Sweetwater Branch is approximately 2.8 miles long, drains 3.3 square miles, and is one of the larger creeks in the Orange Creek Planning unit. Soils in the Sweetwater Branch watershed range from moderately well drained in the upper portion of the watershed to poorly drained in the lower reaches. The creek watershed is mainly contained within the limits of the City of Gainesville where it continues to flow into Paynes Prairie State Preserve and ultimately discharges to the Floridan Aquifer via Alachua Sink. Though there is one permitted domestic wastewater discharge to Sweetwater Branch, urban and residential runoff are thought to be significant sources of bacterial contamination.

For assessment purposes, the watersheds within the Ocklawaha River Basin have been broken out into smaller watersheds, with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed. Sweetwater Branch has been assigned WBID 2711.

Land use in the Ocklawaha basin has historically been dominated by agriculture (citrus farms and row crops). As part of the urbanized Gainesville area, the Sweetwater Branch watershed has undergone extensive urbanization, and now residential and commercial areas around Gainesville account for the majority of land use in the impaired WBID. The distribution of land cover for Sweetwater Branch is based on the National Land Cover Dataset (NLCD) of 1995 and is tabulated in **Table 1**.

Figure 1: Sweetwater Branch WBID 2711

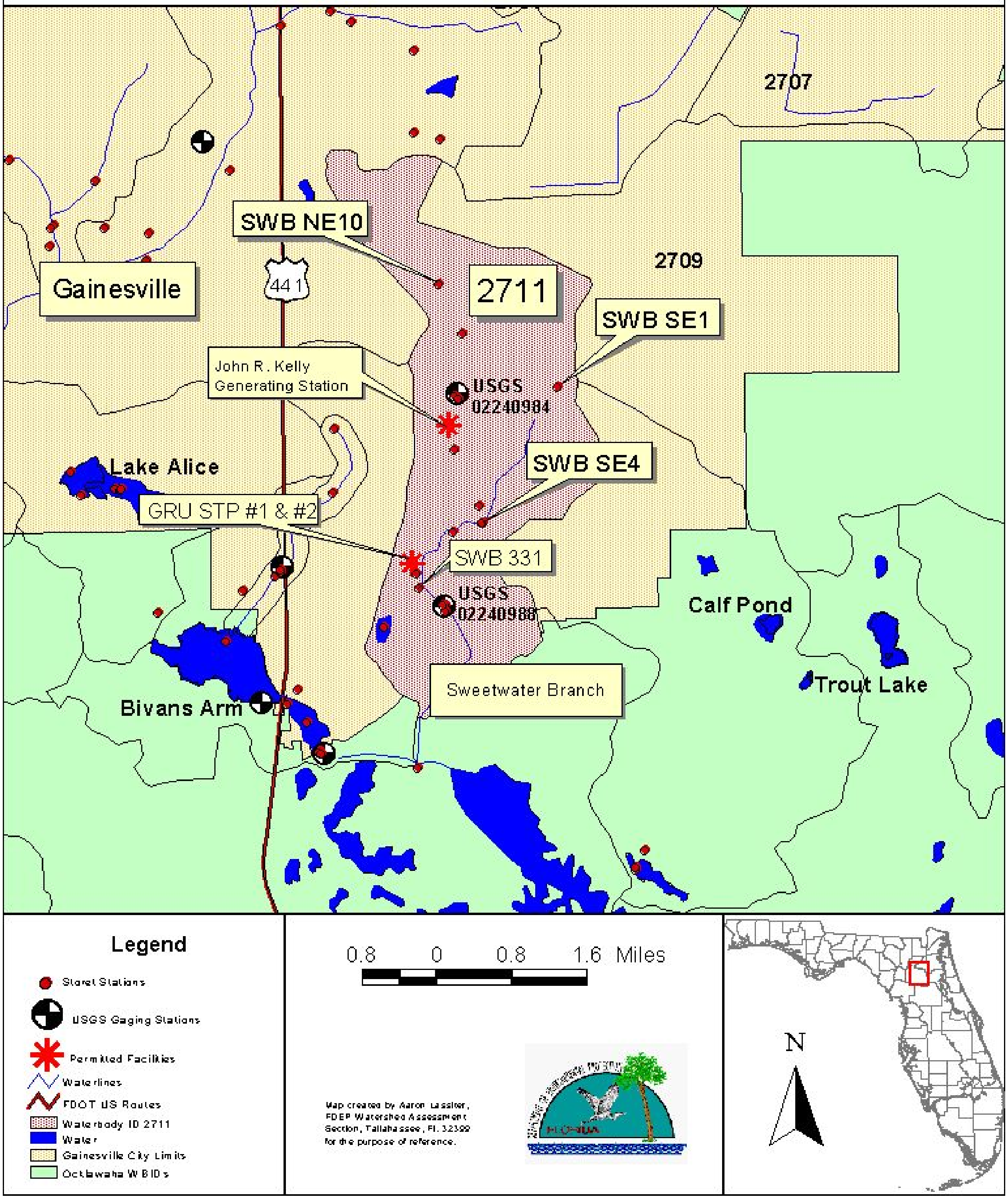

Table 1. Land Cover Distribution[1]

Sweetwater Branch (WBID 2711)		
Land Cover	Total Acres	% Distribution
Urban	1,329.65	62.6
Transport., Commercial, Utilities, Public[2]	206.38	9.7
Agriculture	87.84	4.1
Barren Land	131.43	6.2
Rangeland[3]	44.03	2.1
Forest	153.89	7.2
Wetlands	152.11	7.2
Water	18.01	0.8
Total	2,123.35	100

Notes:

1. Acreage represents the land use distribution in the impaired WBID and not the entire drainage area.
2. Public lands include urban and recreational areas.
3. Rangeland includes shrubland, grassland, and herbaceous land covers.

2.0 STATEMENT OF PROBLEM

Florida's 1998 Section 303(d) list identified Sweetwater Branch (WBID 2718A) in the Ocklawaha River Basin as not supporting water quality standards (WQS) for fecal coliform bacteria. Through analysis of water quality data per the IWR, Sweetwater Branch was verified as impaired for fecal coliform bacteria (see Appendix A for data that were assessed). The creek was included on the list of impaired surface waters adopted by Secretarial Order on August 28, 2002, and then submitted to EPA as part of the 2002 update to Florida's 303(d) list.

3.0 DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND NUMERIC QUALITY TARGET

Sweetwater Branch is classified as Class III waters, with a designated use classification for recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criterion applicable to the observed impairment is the numeric criteria for bacterial quality for fecal bacteria counts (Rule 62-302.530(6), F.A.C.). The criterion has three separate components, expressed as follows:

> 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 rule also states that, for fecal coliform bacteria, monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period.

Insufficient data were collected to base existing loads on the geometric mean criterion for fecal coliform bacteria. As such, the target for the TMDL is the one-day maximum criterion of 800 counts per 100 ml. It is appropriate to use the one-day maximum criteria for TMDL development as this criterion is typically violated during and/or after storm events. For coliforms, an extended dry period followed by a storm event is usually identified as the critical period when coliform levels in waterbodies exceed the water quality criteria.

A statistical summary of all data used for this TMDL is shown in **Table 2** and locations of monitoring stations are shown on **Figure 1.** Data used to compile the statistics shown in **Table 2** are included in **Appendix A**. A comparison of all data results against the daily maximum, 800 counts/100 ml, is shown in **Figure 2**. Water quality data collected by Alachua County are shown in **Figure 3** and were used to estimate the fecal coliform TMDL under current conditions.

Table 2. Summary of Fecal Coliform Monitoring Data

WBID	Total Number Samples	30-Day Geometric Mean	% Samples > 800 counts/100mL	Minimum Concentration (counts/100mL)	Maximum Concentration (counts/100mL)
2711	63	NA	47.6	20	17,000

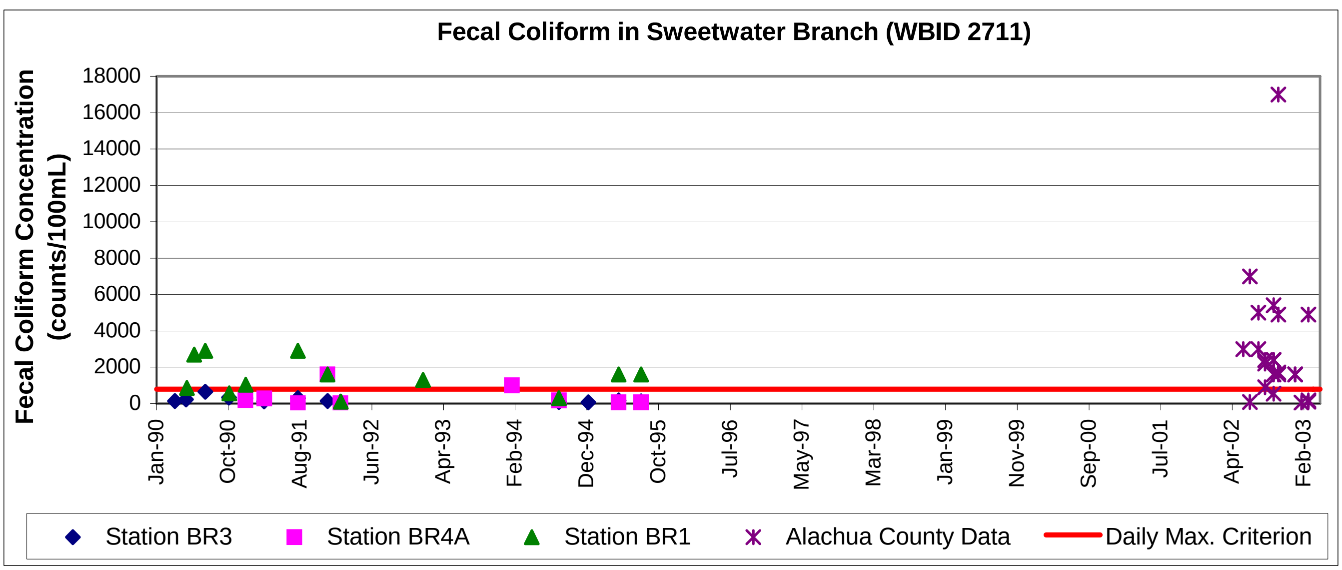

Figure 2: All available data compared to the daily maximum criterion of 800 counts/100 ml.

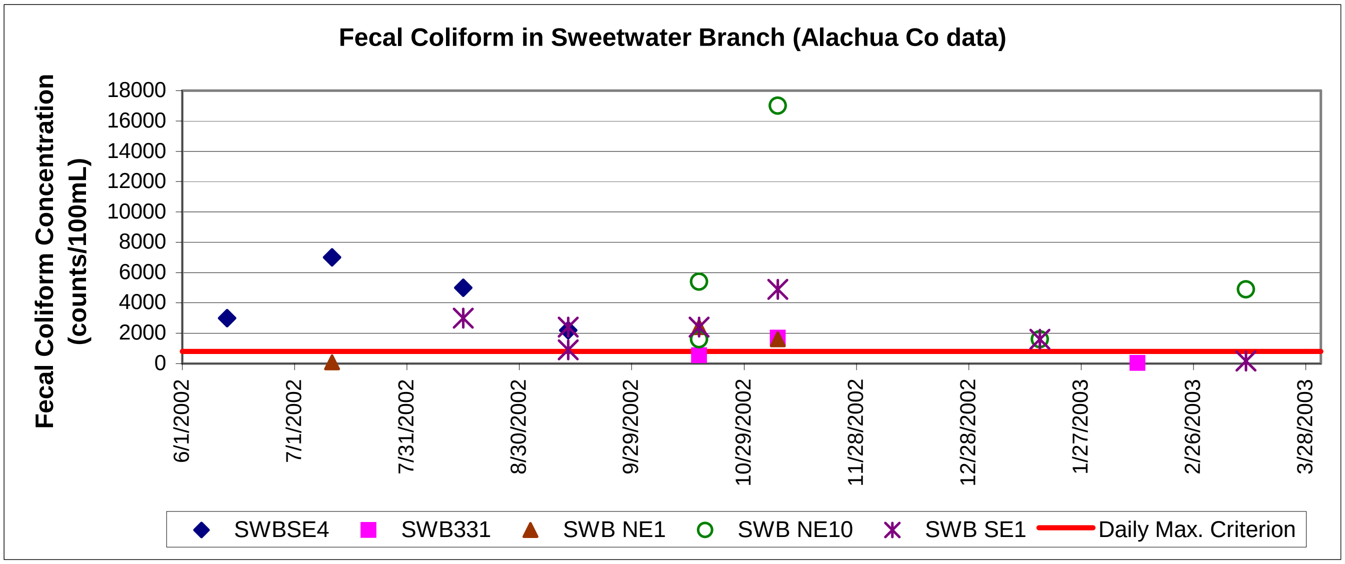

Figure 3: The most current data stations maintained by Alachua County compared to the daily maximum criterion of 800 counts/100 ml.

4.0 ASSESSMENT OF SOURCES

4.1 Types of Sources

An important part of the TMDL analysis is the identification of source categories, source subcategories, or individual sources of coliforms in the watershed and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either "point sources" or "nonpoint sources." Historically, the term point sources has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term "nonpoint sources" was used to describe intermittent, rainfall driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, runoff from agriculture, runoff from silviculture, runoff from 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 EPA's National Pollutant Discharge Elimination Program (NPDES). These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites over five acres, and from a wide variety of industries (see Appendix C for background information about the State and Federal 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). 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 Nonpoint Sources in the Watershed

Nonpoint sources of fecal coliform bacteria generally, but not always, involve accumulation of fecal coliform bacteria on land surfaces and wash off as a result of storm events. Typical nonpoint sources of fecal coliform bacteria include:

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

There are two modes of transport for nonpoint source fecal coliform bacteria loading into the stream. First, loading from failing septic systems and animals in the stream are considered direct sources to the stream, as they are independent of precipitation. The second mode involves loading resulting from fecal coliform accumulation on land surfaces and is transported to the stream during storm events.

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 watershed. This information includes land use categories, point source dischargers, soil types and characteristics, population data (human and livestock), and stream characteristics.

4.2.1 Wildlife

Wildlife deposit fecal coliform bacteria with their feces onto land surfaces where it can be transported during storm events to nearby streams. The bacteria load from wildlife is assumed background, as the contribution from this source is small relative to the load from urban areas.

4.2.2 Agricultural Animals

Agricultural animals can be an important source of fecal coliform loading to streams, through both runoff from pastureland and cattle in streams. Livestock data from the 1997 Census of Agriculture for Alachua encompassing the impaired Sweetwater Branch are listed in **Table 3**. The US Department of Agriculture is currently in the process of updating the agricultural census for 2002. Data from the 2002 Census will be released to the public in Spring 2004. As shown in **Table 3**, cattle, including beef and dairy cows, is the predominate livestock in this county. There are no known Confined Animal Feeding Operations (CAFOs) operating in the impaired WBID.

Table 3. Livestock Distribution by County (source: NASS, 1997)

Livestock	Alachua
Cattle	49,567
Beef	27,324
Dairy	3,341
Swine	1,292
Poultry (broilers sold)	(D)[1]
Sheep	716
Horses	1,731

Notes:
1. (D) – data withheld to avoid disclosing data for individual farms

4.2.3 Onsite Sewerage Treatment and Disposal Systems (Septic Tanks)

Onsite sewage treatment and disposal systems (OSTDs or 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. **Table 4** summarizes the number of septic systems by county and provides estimates of countywide failure rates and total daily discharge of wastewater from septic tanks.

Table 4. County Estimates of Septic Tanks (FDEP, 2001)

County	Number of Septic Tanks[1]	Percent of 1995 Population Using Septic Tanks[2]	Failure Rate per 1000[3]	Estimated Discharge (MGD)[4]
Alachua	37,208	32.7	9.67	5.02

Notes:
1. Total number per county is based on 1970 census figures plus the number of systems installed since 1970 through June 30, 2000. Numbers do not reflect the removal of septic systems by connection to central sewers.
2. Source: St. Johns River Water Management District, May 2000, p. 97, cited in FDEP, 2001.
3. Defined as the number of repairs divided by the number of installed systems for July 1, 1999 to June 30, 2000.
4. Based on value of 135 gallons per day per tank (FDEP, 2001).

4.2.4 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.

4.3 Point Sources

There are several permitted wastewater facilities in the Sweetwater Creek drainage area. However, most of these facilities discharge to percolation ponds, sprayfields, or to the groundwater system, and the only facility authorized to discharge to surface waters in the watershed is the GRU STP Main Street domestic wastewater facility. The facility (NPDES Permit FL0027251), which is authorized to discharge 7.5 mgd to Sweetwater Creek, is within permit effluent fecal coliform limitations for both monthly average and one-day maximum. Based on this information, the effluent does not appear to cause or contribute to coliform impairment in Sweetwater Branch.

Municipal Separate Storm Sewer Systems (MS4s) are also considered point sources and discharge bacteria to waterbodies in response to storm events. Large and medium MS4s serving populations greater than 100,000 people have been required to obtain an NPDES storm water permit for several years under Phase I of the program. As of March 2003, small MS4s serving urbanized areas with a residential population of at least 50,000 people and an overall population density of 1,000 people per square mile are also required to obtain a permit under the Phase II storm water regulations. Based on the 2000 Census, the City of Gainesville will be covered under Phase II of the NPDES Storm Water Program.

5.0 LOADING CAPACITY – LINKING WATER QUALITY AND POLLUTANT SOURCES

5.1 Determination of Assimilative Capacity

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.

Because continuous flow data are not available for Sweetwater Branch and can not accurately be estimated from nearby gages (see below), load duration curves (the "Kansas Method") could not be used to calculate the allowable coliform loading. Instead, the TMDL is based on the percent reduction required to reduce the observed concentrations to the water quality standard.

It should be noted that it is common practice to estimate flows in ungaged streams by using drainage area ratios to nearby, similar gaged streams. However, the karst geology of the Sweetwater Branch watershed, with frequent sinkholes and springs, makes it very difficult to accurately estimate flow at the time of sampling without a continuous gage in a watershed. While there is a continuous flow record for a nearby creek (Hogtown Creek), the drainage area of Sweetwater Branch is too small relative to the drainage area of Hogtown Creek to accurately use a weighted drainage area ratio for estimating flows.

5.2 Percent Reduction Approach

A percent reduction was determined for each station sample result above the target one-day maximum criterion of 800 counts per 100 ml. For the assessment, data collected by Alachua County (which reflects most recent conditions in the stream) were divided into headwater stations (SWB NE1 and SWB NE10), the middle watershed station (SWB SE1, and SWB SE4) and the downstream most station (SWB 331). An average percent reduction was then calculated for each segment. Upstream segments (headwaters through SE4) require the highest percent reduction relative to the downstream location. Data used to compile the statistics shown in **Table 5** are included in **Appendix B**.

Table 5. Average Percent Reduction

Data	Average Reduction (%)[1, 2]
Stations in Headwaters (SWB NE1 and SWB NE10)	68.7
Stations in Midsection (SWB SE1 and SWB SE4)	66.1
Station Downstream (SWB 331)	52.9

Notes:
1. Percent reduction =((result-800)/result)*100
2. Percent reduction calculated for all results >800 counts/100 ml

6.0 CRITICAL CONDITIONS

The critical condition for nonpoint source fecal coliform loading is an extended dry period followed by a rainfall runoff event. During the dry weather period, fecal coliform bacteria builds 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. Alachua County has collected water quality data during both time periods. **Figure 4** shows flow and water quality data collected at SEB SE4, and **Figure 5** illustrates the data collected at SWB SE1. Most of the violations occur during median to high flow conditions.

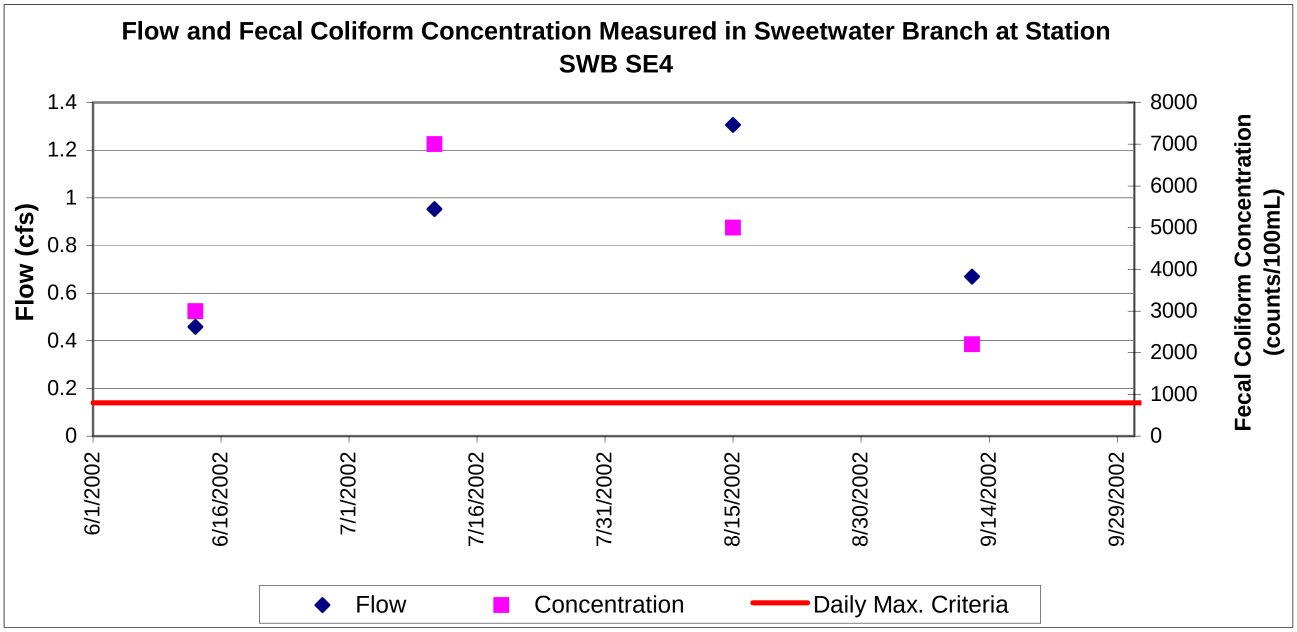

Figure 4: At station SWB SE4, it is not possible to determine if exceedances would occur during flows less than 0.4 cfs.

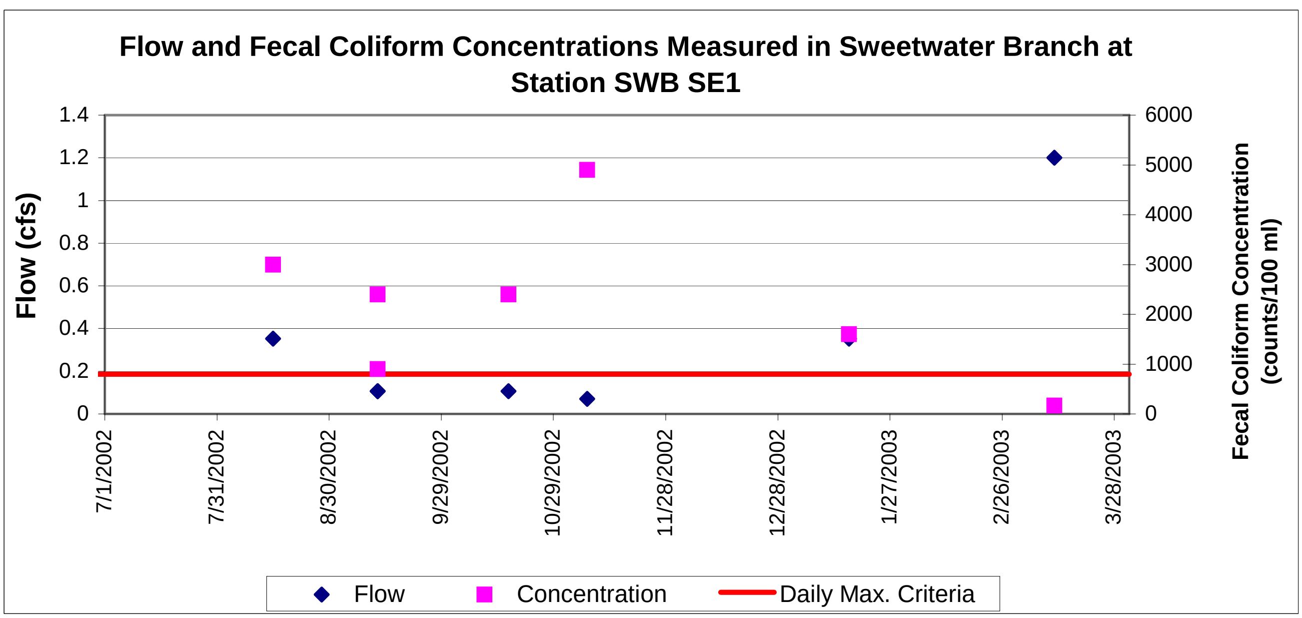

Figure 5: At station SWB SE1, water quality criteria exceedances occur in response to both high and low flows.

7.0 DETERMINATION OF TMDL

A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations), nonpoint 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:

$$TMDL = \Sigma \text{ WLAs} + \Sigma \text{ LAs} + MOS$$

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 <u>other appropriate measure</u>. For Sweetwater Branch, the TMDL is expressed in terms of concentration and the percent reduction required to achieve water quality standards. These units are appropriate, as it is not possible to calculate loads when estimates of flow at the time of sampling are not available.

The WLA is also expressed in units of counts per day. The WLA component represents the maximum one-day load that can occur in any 30-day period. The WLA is based on the NPDES facilities maximum design flow and the permitted one-day maximum concentration. The target load is reduced by the WLA, if any, to obtain the LA component. TMDL components for the impaired WBIDs are provided in **Table 6**.

Table 6. TMDL Components

WBID (Stream Name)	WLA (% reduction)		LA (% reduction)	MOS	TMDL[1] (% reduction)
	Continuous[1] (counts/day)	**MS4 (% reduction)**			
Sweetwater Branch	2.27E+11	70	70	Implicit	70

Notes:

1. Continuous WLA represents the one-day maximum load the NPDES facility can discharge in a 30-day period and not violate water quality standards. The monthly load from this facility cannot exceed 1.7E+12 counts/30days and is based on the monthly average concentration of 200 counts/100ml and the facility design flow.

7.1 Wasteload Allocations (WLAs)

As noted previously, the GRU STP Main Street facility effluent is within permit concentrations for both monthly average and one-day maximum; therefore no reductions are required from this facility. The design flow and fecal coliform loadings for the GRU Main Street facility are summarized in **Table 7**. The fecal coliform loads in **Table 7** are expressed as both a daily maximum load and as a monthly load to reflect dual criteria in the permit of 800 counts/100ml and 200 counts/100ml, respectively. The WLA represents the maximum load the facility can discharge on any one day during a 30-day period.

Table 7. NPDES Facilities Discharging Fecal Coliform Bacteria

Facility Name	NPDES No.	Impacted WBID	Discharge Point	Design Flow (mgd)	WLA
GRU STP Main Street WWTP	FL0027251	2711	Sweetwater Branch	7.5	2.27E+11 counts/day[1]
					1.70E+12 counts/ 30 days[2]

Notes:

1. Bacteria load represents maximum daily load based on facility design flow and permit limit one-day maximum concentration of 800 counts/100mL.
2. Bacteria load represent maximum monthly load based on facility design flow and permit limit monthly maximum concentration of 200 counts/100ml

As noted previously, the City of Gainesville will be covered under Phase II of the NPDES Storm Water Program. EPA guidance specifies that MS4 permits fall under the WLA and be allocated a percentage reduction of the load. However, without sufficient data to characterize the load from the Municipal Separate Storm Sewer Systems (MS4), the wasteload allocation (WLA) is expressed as a percent reduction based on the load allocation (LA) reduction (70%).

Any future facility dischargers in the Sweetwater Branch watershed cannot exceed the above TMDL values. In order for these facilities to discharge into the basin, nonpoint source loads will have to be reduced such that the combined WLA and LA do not exceed the TMDL.

7.2 Load Allocations (LAs)

The LA (nonpoint) is represented as percent reduction required to achieve an in-stream concentration of 800 counts/100 ml. A review of the data indicate the average reduction to achieve an in-stream concentration of 800 is about the same as in the headwater stations (SWB NE1 and SWB NE10) and greater than the downstream station (SWB 331) at the end of the impaired segment. Improving water quality by about 70 percent should improve water quality throughout the watershed. 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 C).

7.3 Margin of Safety (MOS)

There are two methods for incorporating a MOS in the analysis: (1) by implicitly incorporating the MOS using conservative model assumptions to develop allocations, or (2) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations. In this TMDL, an implicit MOS was incorporated by considering all data collected in the WBID. The percent reduction necessary to achieve water quality standards is based on the monitoring station having the largest number of samples and the highest water quality violations. Due to dilution and decay, not all stations require the same reduction to meet standards. By selecting the highest reduction, an implicit MOS is incorporated in the analysis. Additionally, the TMDL sets the water quality standard at the edge of the waterbody/point of discharge. If the allocation is met, dilution and decay could result in instream water quality samples below the numerical criteria and an implicit MOS would be realized.

8.0 SEASONAL VARIATION

Seasonality was addressed by using all water quality data associated with the impaired streams, which were collected during multiple seasons.

REFERENCES

National Agricultural Statistics Service (NASS), Agricultural Census for 1997, U.S. Department of Agricultural

FDEP, 2001, *Ocklawaha Basin Status Report,* Florida Department of Environmental Protection, Division of Water Resource Management, November 2001.

USDA, 1997. *1997 Census of Agriculture, Volume 1, Geographic Area Series, Part 42*, U.S. Department of Agriculture, National Agricultural Statistics Service. AC97-A-42, March 1999.

USEPA, 1991. *Guidance for Water Quality –based Decisions: The TMDL Process.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001, April 1991.

APPENDIX A
WATER QUALITY DATA

Station ID	Date	Parameter	Depth	Remark Code	Result
21FLA 20020093	08/18/99	Fecal Coliform	0.5		210
21FLACEPSWEETWATER BR1	05/08/90	Fecal Coliform	0.5		860
21FLACEPSWEETWATER BR1	06/07/90	Fecal Coliform	1		2700
21FLACEPSWEETWATER BR1	07/24/90	Fecal Coliform	0.5		2900
21FLACEPSWEETWATER BR1	10/31/90	Fecal Coliform	1		566
21FLACEPSWEETWATER BR1	01/08/91	Fecal Coliform	1		1033
21FLACEPSWEETWATER BR1	03/27/91	Fecal Coliform	1		700
21FLACEPSWEETWATER BR1	08/14/91	Fecal Coliform	0.5		2900
21FLACEPSWEETWATER BR1	12/17/91	Fecal Coliform	1		1600
21FLACEPSWEETWATER BR1	02/10/92	Fecal Coliform	0.5		110
21FLACEPSWEETWATER BR1	01/20/93	Fecal Coliform	1	<	1300
21FLACEPSWEETWATER BR1	08/11/94	Fecal Coliform	1		300
21FLACEPSWEETWATER BR1	04/18/95	Fecal Coliform	1	<	1600
21FLACEPSWEETWATER BR1	07/20/95	Fecal Coliform	0.5	>	1600
21FLACEPSWEETWATER BR3	12/13/89	Fecal Coliform	1		100
21FLACEPSWEETWATER BR3	03/19/90	Fecal Coliform	1		140
21FLACEPSWEETWATER BR3	05/03/90	Fecal Coliform	0.5		230
21FLACEPSWEETWATER BR3	06/07/90	Fecal Coliform	0.75		550
21FLACEPSWEETWATER BR3	07/24/90	Fecal Coliform	0.5	>	650
21FLACEPSWEETWATER BR3	10/31/90	Fecal Coliform	1		340
21FLACEPSWEETWATER BR3	01/08/91	Fecal Coliform	1		300
21FLACEPSWEETWATER BR3	03/27/91	Fecal Coliform	1		120
21FLACEPSWEETWATER BR3	08/14/91	Fecal Coliform	1		300
21FLACEPSWEETWATER BR3	12/17/91	Fecal Coliform	1		140
21FLACEPSWEETWATER BR3	02/10/92	Fecal Coliform	0.5		110
21FLACEPSWEETWATER BR3	08/11/94	Fecal Coliform	1		80
21FLACEPSWEETWATER BR3	12/12/94	Fecal Coliform	1		70
21FLACEPSWEETWATER BR3	04/18/95	Fecal Coliform	1		170
21FLACEPSWEETWATER BR3	07/20/95	Fecal Coliform	0.5		130
21FLACEPSWEETWATER BR4A	01/08/91	Fecal Coliform	1		200
21FLACEPSWEETWATER BR4A	03/28/91	Fecal Coliform	1		290
21FLACEPSWEETWATER BR4A	08/14/91	Fecal Coliform	1		20
21FLACEPSWEETWATER BR4A	12/17/91	Fecal Coliform	1		1600
21FLACEPSWEETWATER BR4A	02/10/92	Fecal Coliform	0.5		23
21FLACEPSWEETWATER BR4A	01/26/94	Fecal Coliform	1		1000
21FLACEPSWEETWATER BR4A	08/11/94	Fecal Coliform	1		170
21FLACEPSWEETWATER BR4A	04/18/95	Fecal Coliform	1		70
21FLACEPSWEETWATER BR4A	07/20/95	Fecal Coliform	0.5		70
21FLGW 7467	06/08/00	Fecal Coliform	0.11		1500
21FLGW 9327	08/10/00	Fecal Coliform	0.5		275

Station ID	Date	Parameter	Depth	Remark Code	Result
SWB SE4	06/13/02	Fecal Coliform			3000
SWB SE4	07/11/02	Fecal Coliform			7000
SWB SE4	08/15/02	Fecal Coliform			5000
SWB SE4	09/12/02	Fecal Coliform			2200
SWB331	10/17/02	Fecal Coliform			540
SWB331	11/07/02	Fecal Coliform			1700
SWB331	02/11/03	Fecal Coliform			49
SWB331	03/12/03	Fecal Coliform			110
SWB NE1	07/11/02	Fecal Coliform			80
SWB NE1ST	10/17/02	Fecal Coliform			2400
SWB NE1	11/07/02	Fecal Coliform			1600
SWB NE10	10/17/02	Fecal Coliform			5400
SWB NE10	10/17/02	Fecal Coliform			1600
SWB NE10	11/07/02	Fecal Coliform			17000
SWB NE10	01/16/03	Fecal Coliform			1600
SWB NE10	03/12/03	Fecal Coliform			4900
SWB SE1	08/15/02	Fecal Coliform			3000
SWB SE1	09/12/02	Fecal Coliform			900
SWB SE1	09/12/02	Fecal Coliform			2400
SWB SE1	10/17/02	Fecal Coliform			2400
SWB SE1	11/07/02	Fecal Coliform			4900
SWB SE1	01/16/03	Fecal Coliform			1600
SWB SE1	03/12/03	Fecal Coliform			170

APPENDIX B
CALCULATIONS

Station ID	Date	Result	Reduction (%)[1, 2]
21FLA 20020093	08/18/99	210	
21FLACEPSWEETWATER BR1	05/08/90	860	7.0
21FLACEPSWEETWATER BR1	06/07/90	2700	70.4
21FLACEPSWEETWATER BR1	07/24/90	2900	72.4
21FLACEPSWEETWATER BR1	10/31/90	566	
21FLACEPSWEETWATER BR1	01/08/91	1033	22.6
21FLACEPSWEETWATER BR1	03/27/91	700	
21FLACEPSWEETWATER BR1	08/14/91	2900	72.4
21FLACEPSWEETWATER BR1	12/17/91	1600	50.0
21FLACEPSWEETWATER BR1	02/10/92	110	
21FLACEPSWEETWATER BR1	01/20/93	1300	38.5
21FLACEPSWEETWATER BR1	08/11/94	300	
21FLACEPSWEETWATER BR1	04/18/95	1600	50.0
21FLACEPSWEETWATER BR1	07/20/95	1600	50.0
21FLACEPSWEETWATER BR3	12/13/89	100	
21FLACEPSWEETWATER BR3	03/19/90	140	
21FLACEPSWEETWATER BR3	05/03/90	230	
21FLACEPSWEETWATER BR3	06/07/90	550	
21FLACEPSWEETWATER BR3	07/24/90	650	
21FLACEPSWEETWATER BR3	10/31/90	340	
21FLACEPSWEETWATER BR3	01/08/91	300	
21FLACEPSWEETWATER BR3	03/27/91	120	
21FLACEPSWEETWATER BR3	08/14/91	300	
21FLACEPSWEETWATER BR3	12/17/91	140	
21FLACEPSWEETWATER BR3	02/10/92	110	
21FLACEPSWEETWATER BR3	08/11/94	80	
21FLACEPSWEETWATER BR3	12/12/94	70	
21FLACEPSWEETWATER BR3	04/18/95	170	
21FLACEPSWEETWATER BR3	07/20/95	130	
21FLACEPSWEETWATER BR4A	01/08/91	200	
21FLACEPSWEETWATER BR4A	03/28/91	290	
21FLACEPSWEETWATER BR4A	08/14/91	20	
21FLACEPSWEETWATER BR4A	12/17/91	1600	50.0
21FLACEPSWEETWATER BR4A	02/10/92	23	
21FLACEPSWEETWATER BR4A	01/26/94	1000	20.0
21FLACEPSWEETWATER BR4A	08/11/94	170	
21FLACEPSWEETWATER BR4A	04/18/95	70	
21FLACEPSWEETWATER BR4A	07/20/95	70	

Station ID	Date	Result	Reduction (%)[1, 2]
21FLGW 7467	06/08/00	1500	46.7
21FLGW 9327	08/10/00	275	
SWB NE1	07/11/02	80	
SWB NE1ST	10/17/02	2400	66.7
SWB NE1	11/07/02	1600	50.0
SWB NE10	10/17/02	5400	85.2
SWB NE10	10/17/02	1600	50.0
SWB NE10	11/07/02	17000	95.3
SWB NE10	01/16/03	1600	50.0
SWB NE10	03/12/03	4900	83.7
SWB SE1	08/15/02	3000	73.3
SWB SE1	09/12/02	900	11.1
SWB SE1	09/12/02	2400	66.7
SWB SE1	10/17/02	2400	66.7
SWB SE1	11/07/02	4900	83.7
SWB SE1	01/16/03	1600	50.0
SWB SE1	03/12/03	170	
SWB SE4	06/13/02	3000	73.3
SWB SE4	07/11/02	7000	88.6
SWB SE4	08/15/02	5000	84.0
SWB SE4	09/12/02	2200	63.6
SWB331	10/17/02	540	
SWB331	11/07/02	1700	52.9
SWB331	02/11/03	49	
SWB331	03/12/03	110	

Notes:
1. Percent reduction =((result-800)/result)*100
2. Percent reduction calculated for all results >800 counts/100 ml

Data	Average Reduction (%)[1, 2]
All Data	58.2
Station 21FLACEPSWEETWATER BR1 (in headwaters)	48.1
Alachua County Data Only	66.4
Stations in Headwaters (SWB NE1 and SWB NE10)	68.7
Stations in Midsection (SWB SE1 and SWB SE4)	66.1
Station Downstream (SWB 331)	52.9

The incidence of water quality data exceeding the one-day maximum concentration of 800 counts/ 100ml is summarized by station in **Table 2**. The data used to generate the summary are included in **Appendix A.** Alachua County data, representing current conditions, were used to develop this TMDL.

Table 2. Station Summary of Fecal Coliform Data[1]

Station ID	Sample Number	Violations[1]	Violation Frequency[2]
21FLA 20020093	1	0	0.00
21FLACEPSWEETWATER BR1	13	9	0.69
21FLACEPSWEETWATER BR3	15	0	0.00
21FLACEPSWEETWATER BR4A	9	2	0.27
21FLGW 7467	1	1	100.00
21FLGW 9327	1	0	0.00
SWB SE4	4	4	100.00
SWB331	4	1	0.25
SWB NE1	3	2	0.67
SWB NE10	5	5	100.00
SWB SE1	7	6	0.71
TOTAL	**63**	**30**	**0.48**
Alachua County	**23**	**18**	**0.78**

Notes:

1. Based on one day maximum concentration of 800 counts/100 ml.
2. Violation frequency =violations/sample number

Appendix C

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, 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, Florida Administrative Code (F.A.C.).

The rule requires Water Management Districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a SWIM plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka. No PLRG has been developed for Newnans Lake at the time this study was conducted.

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 to designate certain stormwater discharges as “point sources” of pollution. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific Standard Industrial Classification (SIC) codes, construction sites disturbing five or more acres of land, and master drainage systems of local governments with a population above 100,000 [which are better known as “municipal separate storm sewer systems” (MS4s)]. However, because the master drainage systems of most local governments in Florida are interconnected, EPA has implemented Phase 1 of the MS4 permitting program on a county-wide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the DOT (Department of Transportation) throughout the 15 counties meeting the population criteria.

An important difference between the federal and the state stormwater permitting programs is that the federal program covers both new and existing discharges while the state program focuses on new discharges. Additionally, Phase 2 of the NPDES stormwater permitting program will expand the need for these permits to construction sites between one and five acres, and to local governments with as few as 10,000 people. These revised rules require that these additional activities obtain permits by 2003. While these urban stormwater discharges are now technically referred to as “point sources” for the purpose of regulation, they are still diffuse sources of pollution that can not be easily collected and treated by a central treatment facility similar to other point sources of pollution, such as domestic and industrial wastewater discharges. The DEP recently accepted delegation from EPA for the stormwater part of the NPDES program. It should be noted that most MS4 permits issued in Florida include a re-opener clause that allows permit revisions to implement TMDLs once they are formally adopted by rule.