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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

CENTRAL DISTRICT • MIDDLE ST. JOHNS BASIN

TMDL Report

Fecal Coliform and Total Coliform TMDLs for Long Branch, WBID 3030

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Contents

List of Tables

List of Figures

Web sites

Florida Department of Environmental Protection, Bureau of Watershed Management

TMDL Program

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

Identification of Impaired Surface Waters Rule

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

STORET Program

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

2004 305(b) Report

http://www.dep.state.fl.us/water/docs/2004_Integrated_Report.pdf

Criteria for Surface Water Quality Classifications

http://www.dep.state.fl.us/legal/rules/shared/62-302t.pdf

Basin Status Reports

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

Water Quality Assessment Reports

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

Allocation Technical Advisory Committee (ATAC) Report

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

U.S. Environmental Protection Agency

Region 4: Total Maximum Daily Loads in Florida

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

National STORET Program

http://www.epa.gov/storet/

Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Loads (TMDLs) for fecal and total coliform bacteria for Long Branch in the Middle St. Johns Basin, within the Econlockhatchee Planning Unit. This stream was verified as impaired for fecal and total coliform bacteria, and therefore was included on the Verified List of impaired waters for the Middle St. Johns Basin that was adopted by Secretarial Order on May 27, 2004. The TMDLs establish the allowable fecal and total coliform loadings to Long Branch that would restore the waterbody so that it meets its applicable water quality criteria for fecal and total coliform bacteria.

1.2 Identification of Waterbody

Long Branch (WBID 3030) is located in the northeast part of Orange County. It flows primarily in a westerly direction into the Econlockhatchee (Econ) River and drains about 5.7 square miles **(Figure 1.1).** State Road 50 (S. R. 50) runs through the eastern part of the watershed in a northwest to southeast direction, and County Road 13 (C. R. 13) runs through the central watershed in a north-to-south direction. Most development in the watershed is in an area east of C. R. 13 and west of S. R. 50 in the northern part of the watershed. Pasturelands, pine flatwoods, and mixed wetland hardwoods dominate the rest of the watershed.

According to the U. S. Geological Survey (USGS) 1:100,000 quadrangle map, the elevation decreases from about 20 feet (NAD 27) in the east, to about 15 feet (NAD 27) at the outlet in the western part of the watershed. The average slope for the watershed is about 0.03 percent. More detailed information about the Long Branch watershed can be found in the *Big Econlockhatchee River Basin stormwater management master plan* (CDM, 2003).

For assessment purposes, the Florida Department of Environmental Protection (Department) has divided the Middle St. Johns Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. These TMDLs address **WBID 3030, Long Branch,** for fecal and total coliform.

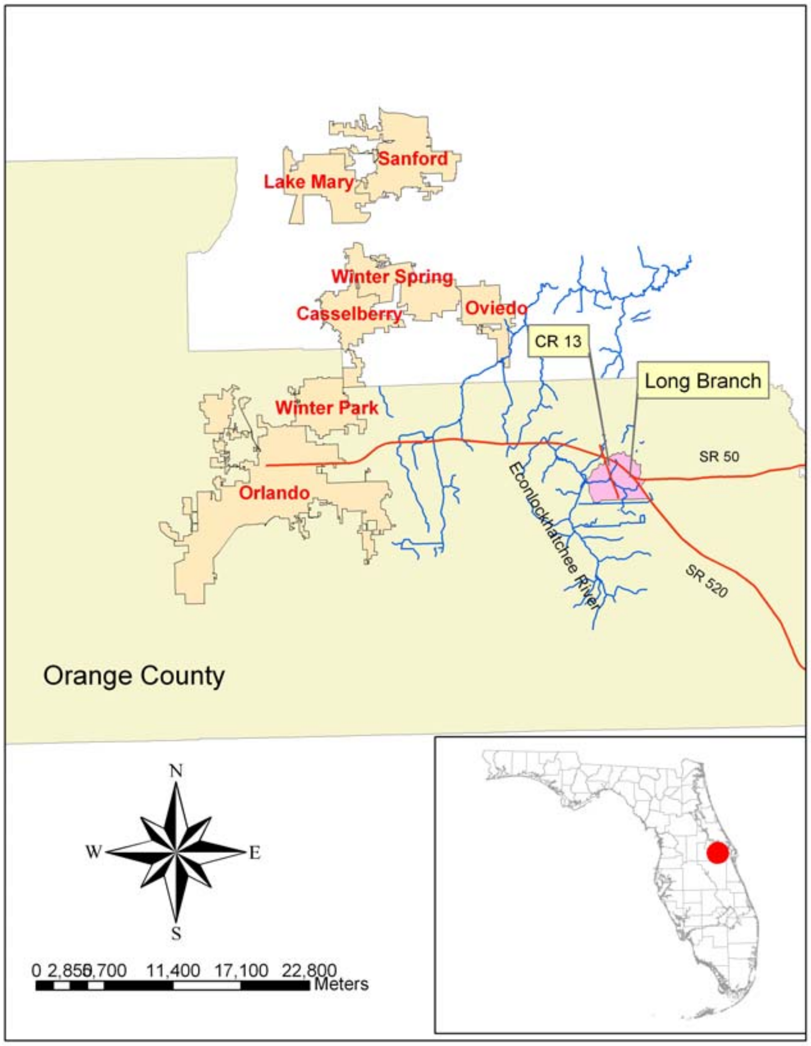
1.3 Background

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

A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting their water quality standards. They provide important water quality restoration goals that will guide restoration activities.

This TMDL report will be followed by the development and implementation of a Basin Management Action Plan, or BMAP, to reduce the amount of fecal and total coliform that caused the verified impairment of Long Branch. These activities will depend heavily on the active participation of the St. Johns River Water Management District (SJRWMD), Orange County government, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for the impaired waterbody.

Figure 1.1: Location of Long Branch in Seminole and Orange Counties, and Locations of S. R. 50, S. R. 520, and the cities of Orlando and Winter Park



Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

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

Florida's 1998 303(d) list included 22 waterbodies in the Middle St. Johns Basin. However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rulemaking process, the Environmental Regulation Commission adopted the new methodology as Rule 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the Long Branch watershed and has verified that the stream is impaired for fecal and total coliform bacteria. **Table 2.1** lists the priority and projected year for TMDL development for each parameter. The verification of impairment was based on the observations that 13 out of 26 fecal coliform samples and 11 out of 26 total coliform samples collected during the verified period (January 1, 1996, through June 30, 2003) exceeded Florida surface water quality criteria (Rule 62-302, F.A.C.). **Table 2.2** summarizes the fecal and total coliform monitoring results for the verified period for Long Branch.

As shown in **Table 2.1**, the projected year for both fecal and total coliform TMDLs was 2004, but the Settlement Agreement between EPA and Earthjustice, which drives the TMDL development schedule for waters on the 1998 303(d) list, allows an additional nine months to complete the TMDLs. As such, these TMDLs must be adopted and submitted to the EPA by September 30, 2005**.**

Table 2.1. Verified Impairment for Fecal and Total Coliform in Long Branch, WBID 3030; TMDL Priority; and Projected Year for TMDL Development

Parameters of Concern	Priority for TMDL Development	Projected Year for TMDL Development
Fecal coliform	High	2004
Total coliform	High	2004

Table 2.2. Summary of Fecal and Total Coliform Monitoring Data for Long Branch, WBID 3030

Parameter	Fecal Coliform	Total Coliform
Total number of samples	26	26
IWR-required number of exceedances for the Verified List	6	6
Number of observed exceedances	13	11
Number of observed exceedances	13	15
Number of seasons during which samples were collected	4	4
Highest observation (MPN/100mL)*	1,441	27,000
Lowest observation (MPN/100mL)	8	434
Median observation (MPN/100mL)	405	2,250
Mean observation (MPN/100mL)	504	3,516
FINAL ASSESSMENT	**Impaired**	**Impaired**

* Most probable number per 100 milliliters.

Figure 2.1 shows the locations of the three water quality monitoring stations in the Long Branch watershed. **Figures 2.2a** and **2.2b** show the seasonal trends for fecal and total coliform concentrations, respectively, at these sites during the verified period (January 1, 1996, through June 30, 2003). The station located on the southern tributary (21FLCEN 20010384) had the highest fecal coliform concentration throughout all the sampling events in 2002, while the fecal coliform concentration at the main channel station (21FLCEN 20010395) was consistently the lowest among the three monitoring sites. In fact, the fecal coliform concentration at the main channel station never exceeded the water quality criterion. Fecal coliform concentrations at all three sites started low in the beginning of the year and peaked in the fourth quarter of the year **(Figure 2.2a).**

No obvious seasonal trend was observed for total coliform bacteria. Except for the first quarter in 2002, the lowest total coliform concentration was observed at the main channel station (940 counts/100mL). This is consistent with the spatial trend for fecal coliform. For 2002, no first-quarter total coliform concentrations were available for the station located in the northern tributary (21FLCEN 20010374). For the second quarter, the concentration at the southern tributary site was significantly higher than that of the northern tributary site, while the concentrations from these two sites are comparable for the rest of the sampling events during the year **(Figure 2.2b).**

Figure 2.1. Locations of Water Quality Monitoring Stations in the Long Branch Watershed, WBID 3030

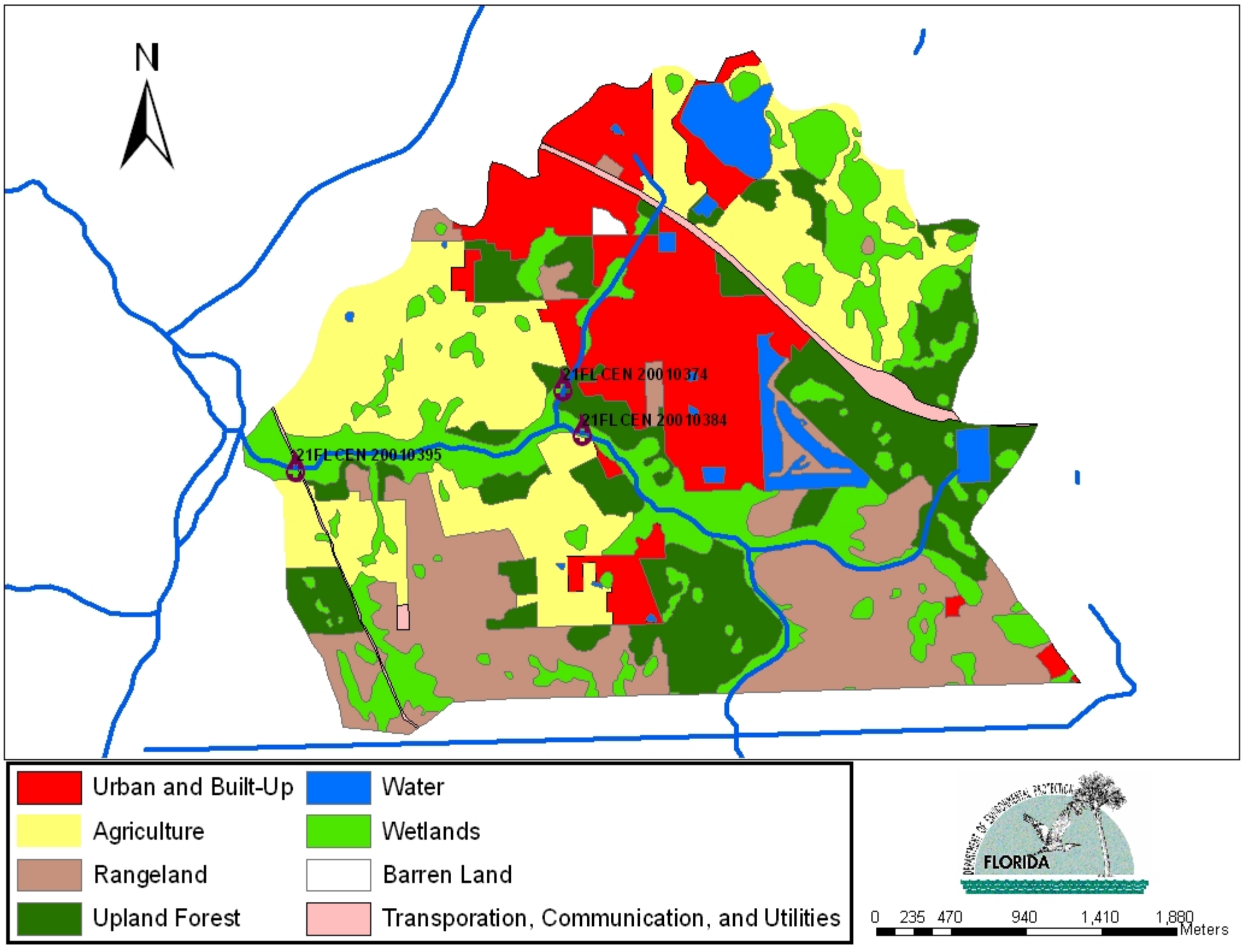


Figure 2.2a. Trend of Fecal Coliform Concentrations

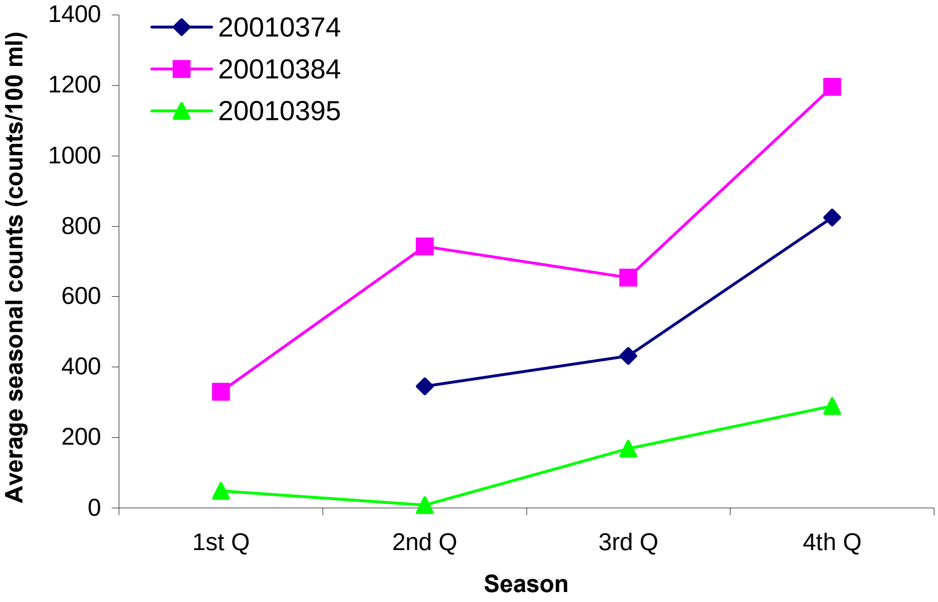
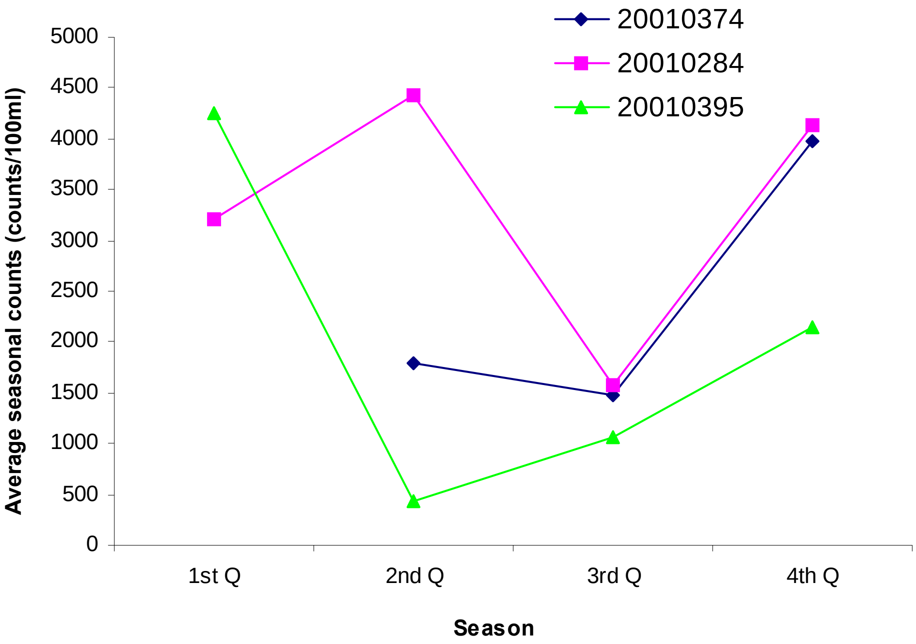


Figure 2.2b. Trend of Total Coliform Concentrations



Chapter 3: DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criteria Applicable to the TMDLs

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

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

Long Branch is a Class III waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The criteria applicable to this TMDL are the Class III criteria for fecal and total coliform.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

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

> ***Fecal Coliform Bacteria:*** *The 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.*
>
> ***Total Coliform Bacteria:*** *The MPN or MF per 100 mL 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.*

The criteria state that monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. During the development of load duration curves for the impaired stream (as described in subsequent chapters), there were insufficient data (fewer than 10 samples in a given month) available to evaluate the geometric mean criterion for either fecal or total coliform bacteria. Therefore, the criteria selected for the TMDLs were not to exceed 400 MPN/100mL in any sampling event for fecal coliform, and not to exceed 2,400 MPN/100mL in any sampling event for total coliform. The 10 percent exceedance allowed by the water quality criterion for fecal coliform bacteria was not used directly in estimating the target load but was included in the margin of safety (as described in subsequent chapters).

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

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

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

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

4.2 Potential Sources of Fecal and Total Coliform in the Long Branch Watershed

4.2.1 Point Sources

No NPDES wastewater facilities were identified in the Long Branch watershed. There are four automobile junkyards, at the northwest end of the S. R. 50 drainage area and the north end of C. R. 13. These facilities, however, are not expected to discharge a significant amount of fecal or total coliform bacteria into ambient water.

Municipal Separate Storm Sewer System Permittees

The Orange County Phase 1 municipal separate storm sewer system (MS4) permit covers the Long Branch watershed. Orange County and the Florida Department of Transportation are co-permittees. No Phase 2 MS4 permits were identified in the watershed.

4.2.2 Land Uses and Nonpoint Sources

Land Uses

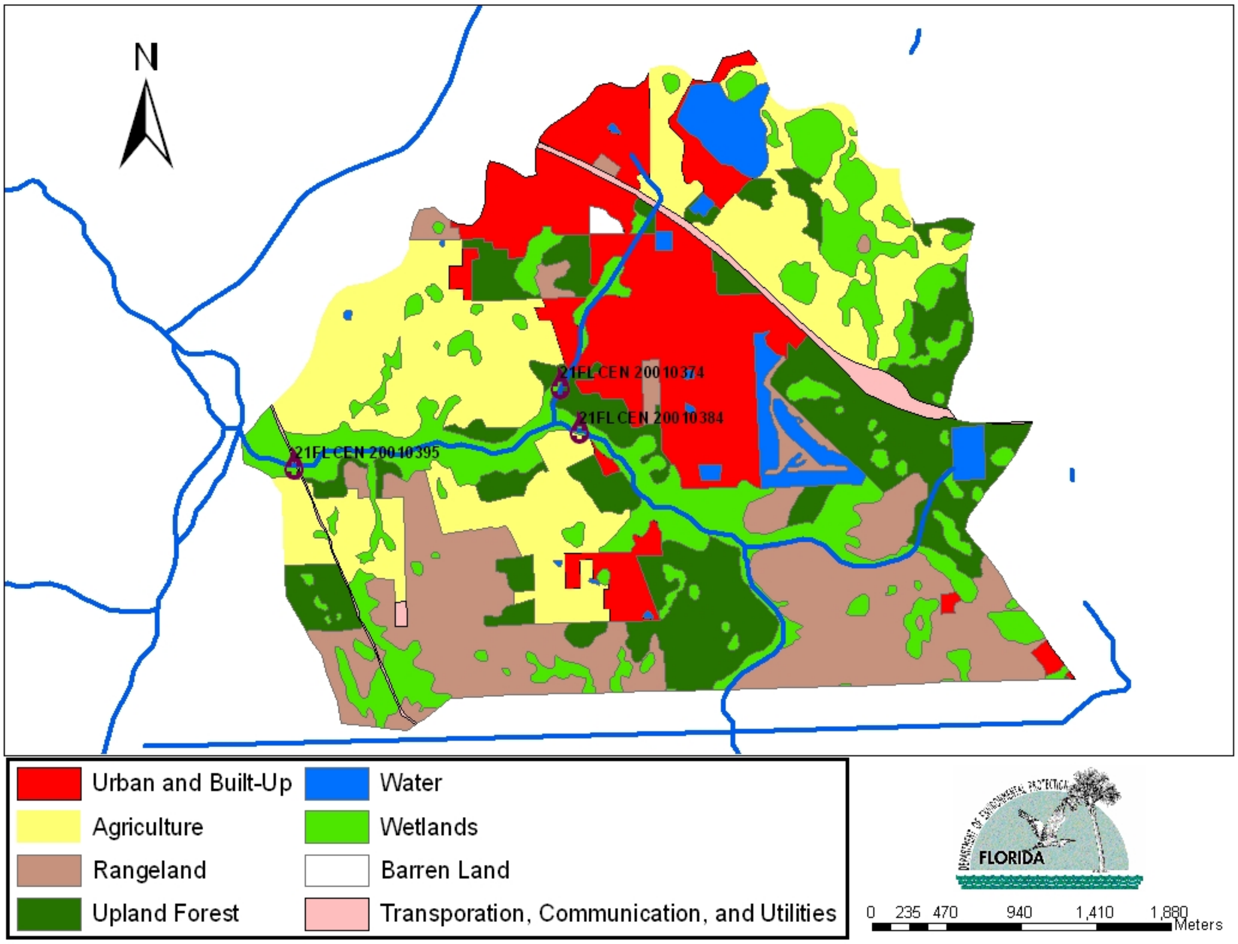
The spatial distribution and acreage of different land use categories were identified using the SJRWMD's year 2000 land use coverage (scale 1:40,000) contained in the Department's geographic information system (GIS) library. Land use categories in the watershed were aggregated using the simplified Level 1 codes and tabulated in **Table 4.1.** **Figure 4.1** shows the principal land uses in the watershed.

As shown in **Table 4.1,** the Long Branch watershed drains about 3,628 acres of land. The dominant land use categories are agriculture and rangeland, which combined account for about 42 percent of the total watershed area. Urban and built-up land; residential; and transportation, communication, and utilities (basically roads) claim about 18 percent of the watershed area. About 36 percent consists of natural lands, including water/wetland and forest.

Table 4.1. Classification of Land Use Categories in the Long Branch Watershed, WBID 3030

Level 1 Code	Land Use	Acreage	% Acreage
1000	Urban and Built-up	286	8%
	Low-density residential	27	1%
	Medium-density residential	245	7%
	Rural residential	54	1%
2000	Agriculture	827	23%
3000	Rangeland	689	19%
7000	Barren land	7	0%
8000	Transportation, communication, and utilities	54	1%
4000	Forest/rural open	615	17%
5000/6000	Water/wetland	685	19%
	TOTAL	3,628	100%

Figure 4.1. Principal Land Uses and Locations of Water Quality Monitoring Stations in the Long Branch Watershed, WBID 3030



Source Assessment

No traditional point sources were identified in the Long Branch watershed; the primary loadings of fecal and total coliform into the stream are generated by nonpoint sources in the watershed. Nonpoint sources of coliform bacteria generally, but not always, come from the accumulation of coliform bacteria on land surfaces that wash off as a result of storm events, and the contribution from ground water from sources such as failed septic tanks and the improper land application of domestic wastewater residuals. Typical nonpoint sources of coliform bacteria include the following:

- Wildlife,
- Agricultural animals,
- Pets in residential areas,
- Onsite sewage treatment and disposal systems (septic tanks),
- Land application of domestic wastewater residuals, and
- Urban development (outside of Phase 1 or 2 MS4 discharges).

No data were available to specifically pinpoint and quantify the major source(s) for fecal and total coliform bacteria in the Long Branch watershed. However, the spatial distribution and the extent and frequency of exceedances among sampling sites sheds some light on the possible sources for the bacterial pollution.

Figure 4.1 shows the locations of the three sampling sites in the Long Branch watershed. The STORET IDs for these sites are 21FLCEN 20010374, 21FLCEN 20010384, and 21FLCEN 20010395; the sites are located in the northern tributary, southern tributary, and main stem, respectively, of Long Branch. **Table 4.2** lists the average fecal and total coliform concentrations from these sites and the frequencies with which fecal and total coliform concentrations exceeded water quality criteria.

Table 4.2. Range of Fecal and Total Coliform Concentrations and Frequency of Exceedances at Each Sampling Site in the Long Branch Watershed, WBID 3030

Station ID	Fecal Coliform			Total Coliform		
	Range (MPN/100mL)	Mean (MPN/100mL)	Frequency (%)	Range (MPN/100mL)	Mean (MPN/100mL)	Frequency (%)
20010374	240–1,020	519	57	1,130–5,067	2,279	29
20010384	330–1,441	748	80	569–6,222	3,392	70
20010395	8–293	163	0	434–4,250	1,735	29

Based on **Table 4.2**, the highest average concentrations and the highest frequency of exceedances for both fecal and total coliform were observed at Station 21FLCEN 20010384. As **Figure 4.1** shows, this station is located in the southern tributary of Long Branch, which drains the eastern, southeastern, and southern parts of the watershed. According to the Orange County Environmental Protection Department (OCEPD), the majority of the southeastern watershed was rangeland with a significant livestock operation. However, Orange County purchased the land in this part of the watershed in 2000, and the livestock operation has stopped operating. However, some horse farms still are present in the southern part of the watershed. Animal droppings in this area could contribute a significant amount of bacteria through either surface runoff (which washes off animal droppings left on the land surface) or direct animal access to the tributary. In addition, a racing track, Orlando SpeedWorld, located in the eastern part of the watershed, also drains to the southern tributary of Long Branch.

The number of horses in the Long Branch watershed was not available at the time this report was prepared. The number was therefore estimated based on the U. S. Department of Agriculture's (USDA) Census of Agriculture data and land use information for the Long Branch watershed and Orange County. Based on the USDA census for 2002, about 1,491 horses were recorded for all of Orange County. Based on the land use GIS coverage from the St. Johns and South Florida Water Management Districts for 1995, the pastureland area in Orange County totaled about 49,050 acres. Based on this information, the countywide horse density was 0.03 horses/acre. The total pastureland area in Long Branch was about 787 acres based on SJRWMD land use coverage. This translates into 24 horses in the Long Branch watershed.

Assuming that daily fecal coliform loading per horse is 4.3×10^9 counts/horse (MapTech, 2000) and total coliform loading is 2.2×10^{12} counts/horse (EPA, 2001), the fecal and total coliform daily loadings to Long Branch are 1.03×10^{11} counts/day and 5.3×10^{13} counts/day, respectively. It should be noted that these estimates represent the load created by the watershed, and no transport attenuation rate was considered. The final loads that reach the stream could be significantly less than these estimates.

The site with the second most frequent number of fecal and total coliform exceedances is Station 21FLCEN 20010374, located on the northern tributary of Long Branch, which drains the northern part of the watershed. The most likely source of bacterial pollution in this area is the medium-density residences located along both sides of C. R. 13 and the west side of S. R. 50. According to the OCEPD, this residential area mainly consists of mobile homes, and all of these dwellings are on septic tanks. A field reconnaissance conducted by the Department in May 2005 found that stormwater from the residential area drains through ditches along C. R. 13 and discharges directly into the northern tributary of Long Branch. If there are any septic tank failures in the area, the coliform bacteria brought to the land surface could be easily flushed into stormwater ditches and carried into the stream. In addition, dogs, chickens, and other domestic animals in the area are another potential source of fecal pollution.

A rough estimate of fecal and total coliform loads from failed septic tanks in the Long Branch watershed can be made using Equation 1:

$$\mathbf{L = 37.85 * N * Q * C * F} \qquad \mathbf{(1)}$$

Where:

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

Based on the year 1999 Digital Ortho Quarter Quads (DOQQs) aerial photography, about 150 housing units were identified in the Long Branch watershed. Given that the entire watershed is on septic tanks, this translates into about 150 septic tanks (N) in the area.

The discharge rate from each septic tank (Q) was calculated by multiplying the average household size by the per-capita wastewater production rate per day. Based on information published by the U. S. Census Bureau, the average household size for Orange County is about 2.5 people/household. The same population density was assumed for the Long Branch watershed. A commonly cited value for per-capita wastewater production rate is 70 gallons/day/person (EPA, 2001).

The commonly cited concentrations (*C*) for septic tank discharge are 1×10^6 counts/100mL and 2.3×10^7 counts/100mL for fecal and total coliform, respectively (EPA, 2001).

No measured septic tank failure rate data were available for the watershed at the time this report was prepared. Therefore the failure rate was derived from the number of septic tanks and septic tank repair permits for the county published by the Florida Department of Health (FDOH) (http://www.doh.state.fl.us/environment/ostds/statistics/ostdsstatistics.htm). The number of septic tanks in the county was calculated based on the assumption that none of the installed septic tanks would be removed after installation **(Table 4.3).** The reported number of septic tank repair permits was also obtained from the FDOH Web site **(Table 4.3).**

Based on this information, a discovery rate of failed septic tanks for each year between 1996 and 2001 was calculated and listed in **Table 4.3**. The table shows that the annual septic tank failure discovery rate for Orange County from 1996 to 2001 averaged about 1.1 percent. Assuming that failed septic tanks are not discovered for about 5 years, the estimated annual septic tank failure rate is about 5 times the discovery rate, or 5.3 percent. Based on Equation 1, the estimated fecal and total coliform loadings from failed septic tanks in the watershed are about 5.2×10^{10} and 1.2×10^{12} counts/day, respectively.

Table 4.3. Estimated Septic Tank Numbers and Failure Rates for Orange County, 1996–2001

	1996	1997	1998	1999	2000	2001	Average
New installation (septic tanks)	996	557	441	589	728	902	702
Accumulated installation (septic tanks)	97,536	98,093	98,534	99,123	99,851	100,753	98,982
Repair permit (septic tanks)	1,601	803	970	665	1,183	1,117	1,057
Failure discovery rate (%)	1.6	0.8	1.0	0.7	1.2	1.1	1.1
Failure rate (%)*	8.2	4.1	4.9	3.4	5.9	5.5	5.5

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

The lowest average concentration and frequency of bacterial exceedances were observed at Station 21 FLCEN 20010395, a downstream site on the main stem of Long Branch. Mixed wetland hardwoods flank most of the main stem. Both the SJRWMD and Orange County purchased lands along the main stem. According to the OCEPD, these lands form a buffer zone of about 500 feet on each side of the stream.

Although some rangelands and livestock operations were observed in this part of the watershed, the direct discharge of fecal and total coliform bacteria into the main stem of the stream is not expected because of the wide buffer zone. This may explain the low fecal and total coliform concentrations observed at this monitoring site. The low concentrations at the site also suggest that the contribution from wildlife is not significant.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

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

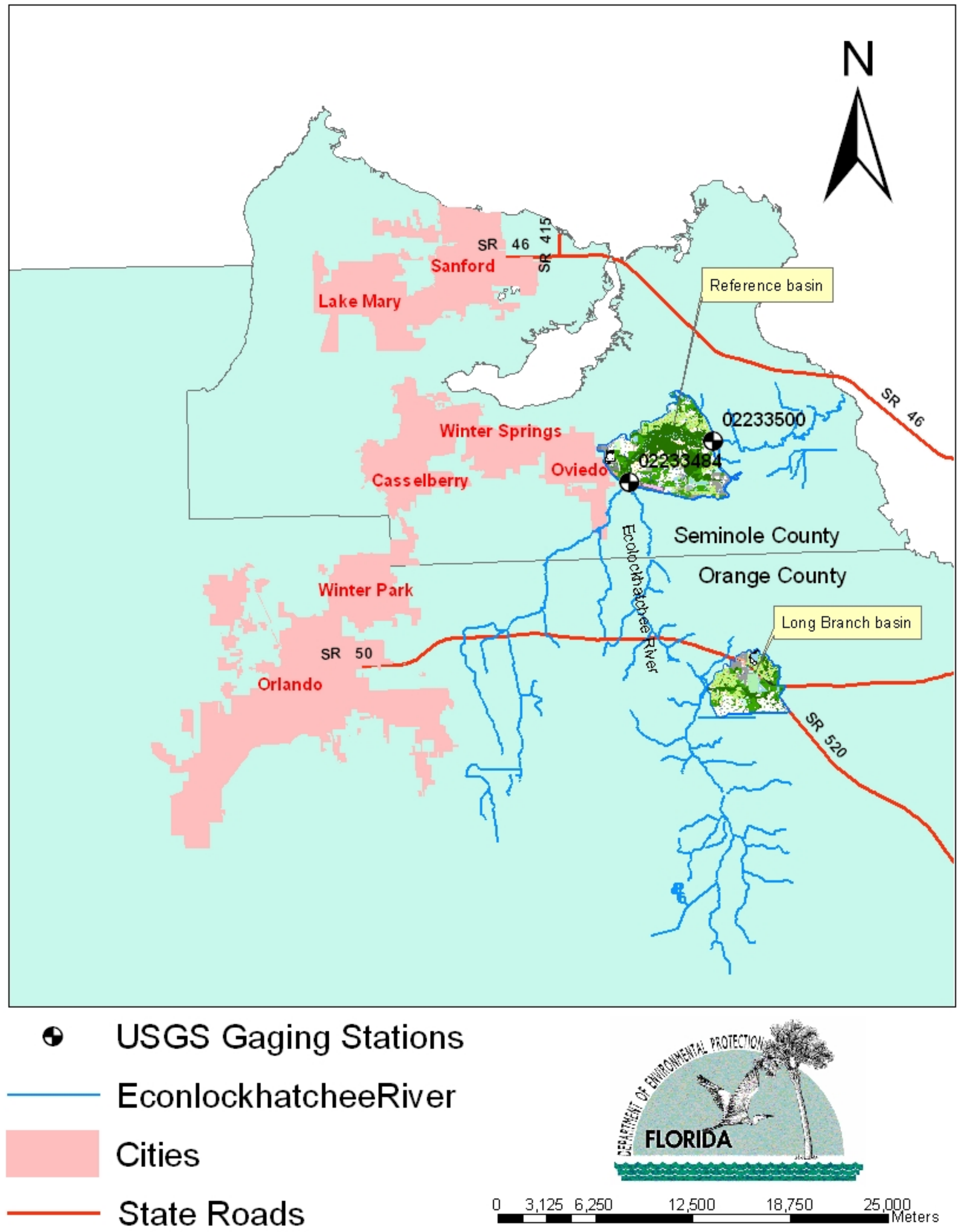
1. Develop the flow duration curve,
2. Develop the load duration curve for both the allowable load and existing loading,
3. Define the critical conditions, and
4. Establish the needed load reduction by comparing the existing loading with the allowable load under critical conditions.

5.1.1 Data Used in the Determination of the TMDL

Fecal and total coliform concentrations and flow measurements were required to estimate both the allowable pollutant loading and existing loading to Long Branch. **Figure 4.1** shows the locations of the water quality monitoring stations in the watershed from which fecal and total coliform data were collected. There is no USGS gaging station in the Long Branch watershed or in neighboring watersheds with similar size and land use characteristics. Therefore, the flow for the Long Branch watershed was derived from two adjacent USGS gaging stations located on the Econ River (USGS 02233484 and USGS 02233500) **(Figure 5.1).** Flow measurements from both stations were downloaded from the USGS water resource Web site (http://waterdata.usgs.gov/usa/nwis/sw). The following sections describe the detailed procedures used to derive the flow for Long Branch based on flow measurements from these USGS stations.

This TMDL report used fecal and total coliform data collected during the verified period (January 1, 1996, through June 30, 2003). During this period, 29 samples were collected for both fecal and total coliform bacteria from 3 sampling stations located in the Long Branch watershed. Data used for this report were retrieved from the Department’s IWR database and were mainly provided by the Department’s Central District office. Fecal and total coliform results from a field survey conducted by the Department in February 2005 were also used. Because of the limited number of fecal and total coliform observations for each water quality monitoring station, fecal and total coliform measurements from all 3 stations were pooled, and 1 TMDL was developed for each parameter (fecal or total coliform) for the entire watershed.

Figure 5.1. Locations of USGS Gaging Stations on a Reference Watershed Used To Derive Stream Flow Measurements for the Long Branch Watershed, WBID 3030



5.1.2 TMDL Development Process

Develop the Flow Duration Curve

The first step in the development of 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 duration curve relates flow values measured at a monitoring station to the percent of time the flow values were equalled 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.

Because no measured flow was available for the Long Branch watershed, flow measurements from two USGS gaging stations located on the Econ River were used to derive the flow for the Long Branch watershed. As both stations measure the mainstem flow of the Econ River, the watershed areas draining to the stations are much larger than that of the Long Branch watershed, and their characteristics differ from those of the Long Branch watershed. According to the USGS water resource Web site, the watershed area draining to USGS 02233484 is about 228.6 square miles, and the watershed area draining to USGS 02233500 is about 241 square miles. In contrast, the area of the Long Branch watershed is about 5.7 square miles.

Given these differences in area, deriving the flow for the Long Branch watershed directly on the basis of either of the stations in the reference watershed would not be reasonable. As the 2 reference stations are located very close to each other, however, the difference in the measured flow for each station is the surface runoff contributed by a relatively small watershed **(Figure 5.1).** The area of the reference watershed is 241 minus 228.6 square miles, or 12.4 square miles. The ratio of the area of the reference watershed and the area of the Long Branch watershed is then 12.4/5.7 = 2.2, which is allowable in applying the basin ratio method to develop the flow for an ungaged watershed.

The land use pattern in the reference watershed was analyzed and compared with that of the Long Branch watershed. **Table 5.1** lists the percent land use for both watersheds. The distribution of land use between the two watersheds is generally similar, except that the reference watershed has more wetland area and the Long Branch watershed has more rangeland area. Wetlands usually have a higher runoff coefficient than rangeland. Therefore, using the stream flow from the reference watershed to derive the stream flow for the Long Branch watershed may slightly overestimate the actual flow for Long Branch.

Table 5.1. Land Use Patterns in the Long Branch Watershed, WBID 3030, and the Reference Watershed

FLUCCS Level 1	Description	Reference Watershed (% of area)	Long Branch Watershed (% of area)
1000	Urban and Built-up	10	16
2000	Agriculture	20	24
3000	Rangeland	6	19
4000	Upland Forest	19	17
5000	Water	3	4
6000	Wetland	41	19
7000	Barren Land	0	0
8000	Transportation	1	1

The hydrologic characteristics of the soils in both the Long Branch and the reference watersheds were also analyzed and compared. For the Long Branch watershed, B/D, C, and D soils, which have a relatively low permeability but a high potential to produce surface runoff, account for about 98 percent of the soil acreage. Water and some unidentified soils account for the remaining 2 percent. For the reference watershed, B/D, C, and D soils account for about 84 percent of the soil acreage, while A soil, which has relatively high permeability and a low potential to produce surface runoff, accounts for 14 percent. Water and other unidentified soils account for the remaining 2 percent.

The higher percentage of B/D, C, and D soils in the Long Branch watershed than in the reference watershed may result in greater surface runoff in the Long Branch watershed compared with the reference watershed. This compensates for the trend in land use patterns, which suggested that the reference watershed, which has more wetland areas, may produce more runoff than the Long Branch watershed.

The total flow contributed by the reference watershed (including surface runoff and baseflow) was calculated as the difference in flow measured at the two stations. Because the flow measurements at these two stations are substantially higher than the difference between the stations, the estimates of the flow contribution from the reference watershed will be affected by any error in the flow measurements from the two stations. To minimize this interference, the following steps were taken:

1. Annual average daily flows were calculated for both stations,
2. An average ratio between the long-term annual average daily flows for the two stations was estimated,
3. The long-term average ratio was multiplied by the daily flow measurement of the upstream station (USGS 02233484) to produce the flow measurement for the downstream station (USGS 02233500), and
4. The difference between the calculated flow at the downstream station (USGS 02233500) and measured flow at the upstream station (USGS 02233484) was considered to be the flow contribution from the reference watershed.

The analysis used flow measurements from January 1, 2000, to December 31, 2002, for both gaging stations. **Table 5.2** lists the annual average daily flow and the ratio between the daily flows of the two stations. The long-term average ratio between annual average daily flows from the two stations was calculated as the flow at USGS 02233500 divided by the flow at USGS 02233484, or about 106 percent. The flow for USGS 02233500 was calculated by multiplying the flow measurement at USGS 02233484 by the flow ratio. The flow contribution from the reference watershed was calculated as the difference between the calculated flow at USGS 02233500 and the measured flow at USGS 02233484.

Table 5.2. Annual Average Daily Flows and the Ratio Between Annual Average Daily Flows Measured at USGS Gaging Stations 02233484 and 02233500, 2000–02

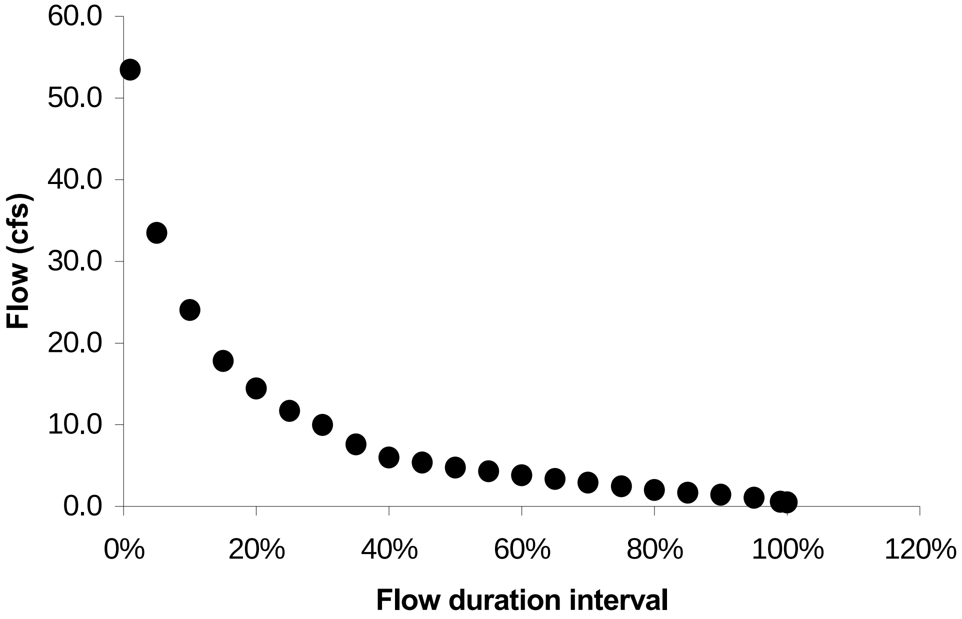
Year	Annual Average Daily Flow for USGS 02233484 (cfs)	Annual Average Daily Flow for USGS 02233500 (cfs)	Difference of Average Daily Flow Between the Two Stations (cfs)	Ratio of Average Daily Flow For USGS 02233500/ 02233484 (%)
2000	91	97	6	106
2001	408	431	23	106
2002	465	488	24	105

cfs – Cubic feet per second.

Because the watershed area ratio between the reference and Long Branch watersheds is about 2.2, the daily flows at the outlet of the Long Branch watershed were derived from the flow of the reference watershed by dividing the flow contribution of the reference watershed by 2.2. The calculated daily flow at the outlet of the Long Branch watershed was used for the flow duration and load duration analyses described below.

The flow duration curve was created by using the percentile function and the flow record to generate the flow at a given duration interval. For example, at the 90th duration interval, the percentile function calculates the flow that is equal to or exceeded 90 percent of the time. **Figure 5.2** shows the flow duration curves for Long Branch generated from the calculated daily flow at the outlet, using the method described above. Flows on the right side of the plot are exceeded more frequently and indicate low-flow conditions. Flows on the left side of the plot are exceeded less frequently and represent high flows.

Figure 5.2. Flow Duration Curve for Long Branch, WBID 3030



Develop the Load Duration Curves for Both the Allowable Load and Existing Loading Capacity

Flow duration curves are transformed into load duration curves by multiplying the flow values along the flow duration curve by the fecal or total coliform concentration and the appropriate conversion factors. The final results of the load are typically expressed as counts per day. Equations 2 and 3, as follows, were used to calculate the allowable loads and the existing loading:

Allowable load = (observed flow) x (conversion factor) x (state criteria) (2)

Existing loading = (observed flow) x (conversion factor) x (coliform measurement) (3)

On the load duration curve, allowable and existing loads are plotted against the flow duration ranking. The allowable loads were calculated based on water quality criteria and flow values from the flow duration curve, and the line drawn through the data points representing the allowable loads is called the target line. The existing loads are based on the instream fecal or total coliform concentrations measured during ambient monitoring and an estimate of flow in the stream at the time of sampling. As noted previously, because insufficient data were collected to evaluate the fecal coliform geometric mean, 400 MPN/100mL and 2,400 MPN/100mL were used as target criteria for fecal and total coliform, respectively. **Figures 5.3a** and **5.3b** show both the allowable loads and the existing loads over the flow duration ranking for Long Branch. The points of the existing loads that were higher than the allowable loads at a given flow duration ranking were considered exceedances of the criteria.

As shown in **Figures 5.3a** and **5.3b,** exceedances of the fecal and total coliform criteria in the Long Branch watershed occur across the entire span of the flow record. In general, exceedances on the right side of the curve typically occur during low-flow events, implying a contribution from either point sources or baseflow, which could come from the loads from failed septic tanks and sewer line leakage interacting with surface water. The exceedances that appear on the left side of the curve usually represent loading from stormwater-related sources. In this case, the potential sources may include contributions from pets such as dogs and cats, livestock, failed septic tanks, and sewer line leakage.

Define the Critical Condition

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

For the Long Branch watershed, exceedances occurred across the entire span of flow conditions. Because no major point sources were identified in the watershed, exceedances that appeared in all these intervals were considered to be from nonpoint sources. Critical conditions are accounted for in the load curve analysis by using the flow records and water quality data available in the 10th to 90th percentile flow duration interval. Values for flows that are exceeded less than 10 percent of the time were not used because they represent abnormally high-flow events, and values for flows occurring more than 90 percent of the time were not used because they are extreme low-flow events.

Figure 5.3a. Load Duration Curves for Allowable Load and Existing Loading Capacity for Fecal Coliform

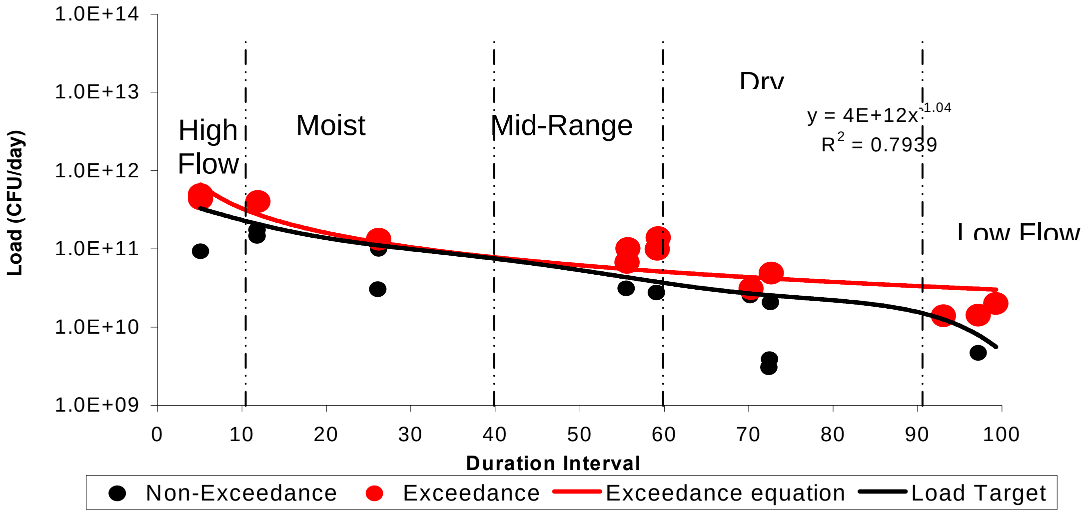
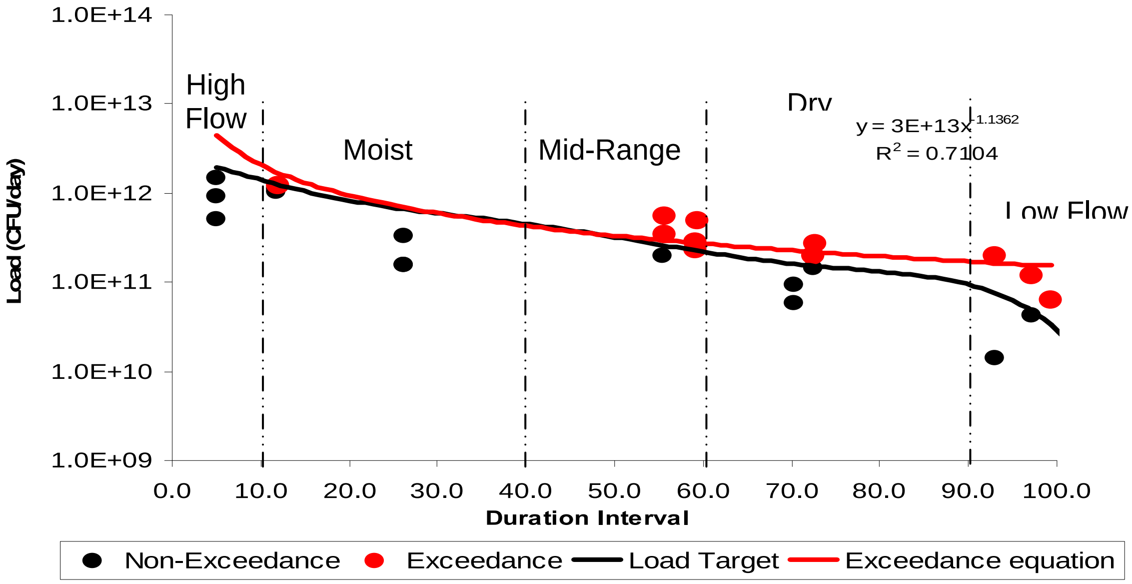


Figure 5.3b. Load Duration Curves for Allowable Load and Existing Loading Capacity for Total Coliform



Establish the Needed Load Reduction by Comparing the Existing Load with the Allowable Load under the Critical Condition

The fecal and total coliform load reductions required to achieve water quality criteria were established by comparing the existing loading with the allowable loading at each flow recurrence interval between the 10th and 90th percentile (in increments of 5 percent). The actual needed load reduction was calculated using the following equation:

$$\textbf{Load reduction} = \frac{\textbf{Existing loading} - \textbf{Allowable loading}}{\textbf{Existing loading}} \times \textbf{100\%} \qquad \textbf{(4)}$$

The *allowable loading* at each recurrence interval was calculated as the product of the water quality criterion and the flow corresponding to the given recurrence interval. To calculate the *existing loading,* a trend line was fitted to the loads that exceeded the *allowable loading*. Several types of trend lines were examined, and the power function was found to have the highest correlation coefficient for both fecal coliform loading ($R^2 = 0.7939$) and total coliform loading ($R^2 = 0.7104$). Therefore, power functions were used to predict the existing loads corresponding to the flow recurrence intervals used by the *allowable loading.* Equations 5 and 6 are the power equations developed for fecal and total coliform, respectively:

$$\textbf{For fecal coliform: } Y = 4E + 12X^{-1.04} \qquad \textbf{(5)}$$

$$\textbf{For total coliform: } Y = 3E + 13X^{-1.14} \qquad \textbf{(6)}$$

Where:

X is the flow recurrence interval between the 10th and 90th percentile, and
Y is the predicted *existing loading* for fecal coliform (Equation 5) and total coliform (Equation 6).

Figures 5.3a and **5.3b** show the resulting trend lines for both fecal and total coliform bacteria. After the trend lines were developed, they were used to determine the percent reduction required to achieve the numeric criterion. At each recurrence interval between the 10th and 90th percentile (in increments of 5 percent), the equation of the trend line was used to estimate the *existing loading*.

The percent reduction required to achieve the target load was then calculated at each interval, and the final percent reduction needed was the median of these values. The TMDLs and percent reductions were calculated as the median of all the loads and percent reductions calculated at the various recurrence intervals between the 10th and 90th percentile. **Tables 5.3a** and **5.3b** show the calculation of the TMDLs and percent reductions for fecal and total coliform, respectively, in the Long Branch watershed.

Table 5.3a. Calculation of TMDL and Percent Reduction for Fecal Coliform in the Long Branch Watershed, WBID 3030

Interval	Allowable Load (counts/day)	Existing Load[1] (counts/day)	% Reduction
90	1.43E+10	3.71E+10	61.6%
85	1.66E+10	3.94E+10	57.9%
80	1.99E+10	4.20E+10	52.7%
75	2.40E+10	4.49E+10	46.6%
70	2.86E+10	4.82E+10	40.7%
65	3.29E+10	5.21E+10	36.8%
60	3.74E+10	5.66E+10	34.0%
55	4.23E+10	6.20E+10	31.7%
50	4.64E+10	6.84E+10	32.1%
45	5.27E+10	7.63E+10	31.0%
40	5.87E+10	8.63E+10	31.9%
35	7.43E+10	9.91E+10	25.1%
30	9.76E+10	1.16E+11	16.1%
25	1.14E+11	1.41E+11	18.7%
20	1.41E+11	1.77E+11	20.3%
15	1.74E+11	2.39E+11	27.2%
10	2.35E+11	3.65E+11	35.5%
Median	**4.64E+10**	**6.84E+10**	**32.1%**

Table 5.3b. Calculation of TMDL and Percent Reduction for Total Coliform in the Long Branch Watershed, WBID 3030

Interval	Allowable Load (counts/day)	Existing Load[1] (counts/day)	% Reduction
90	8.55E+10	1.81E+11	52.7%
85	9.96E+10	1.93E+11	48.3%
80	1.19E+11	2.07E+11	42.3%
75	1.44E+11	2.22E+11	35.3%
70	1.72E+11	2.40E+11	28.7%
65	1.98E+11	2.62E+11	24.5%
60	2.24E+11	2.87E+11	21.8%
55	2.54E+11	3.16E+11	19.7%
50	2.79E+11	3.52E+11	21.0%
45	3.16E+11	3.97E+11	20.4%
40	3.52E+11	4.54E+11	22.4%
35	4.46E+11	5.29E+11	15.7%
30	5.86E+11	6.30E+11	7.0%
25	6.86E+11	7.75E+11	11.4%
20	8.49E+11	9.98E+11	15.0%
15	1.05E+12	1.38E+12	24.4%
10	1.41E+12	2.19E+12	35.6%
Median	**2.79E+11**	**3.52E+11**	**22.4%**

Chapter 6: DETERMINATION OF THE TMDL

6.1 Expression and Allocation of the TMDL

The objective of a TMDL is to provide a basis for allocating acceptable loads among all of the known pollutant sources in a watershed so that appropriate control measures can be implemented and water quality standards achieved. A TMDL is expressed as the sum of all point source loads (wasteload allocations, or WLAs), nonpoint source loads (load allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

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

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

$$\textbf{TMDL} \cong \sum \textbf{WLAs}_{\textbf{wastewater}} + \sum \textbf{WLAs}_{\textbf{NPDES Stormwater}} + \sum \textbf{LAs} + \textbf{MOS}$$

It should be noted that the various components of the revised TMDL equation may not sum up to the value of the TMDL because (a) the WLA for NPDES stormwater is typically based on the percent reduction needed for nonpoint sources and is also accounted for within the LA, and (b) TMDL components can be expressed in different terms (for example, the WLA for stormwater is typically expressed as a percent reduction, and the WLA for wastewater is typically expressed as mass per day).

WLAs for stormwater discharges are typically expressed as “percent reduction” because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish loads from MS4s from other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the “maximum extent practical” through the implementation of best management practices (BMPs).

This approach is consistent with federal regulations (40 CFR § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or **other appropriate measure**. The TMDLs for Long Branch are expressed in terms of colonies/day and percent reduction, and represent the maximum daily fecal and total coliform loads the stream can assimilate and maintain the fecal and total coliform criteria **(Table 6.1).**

Table 6.1. TMDL Components for Fecal and Total Coliform in the Long Branch Watershed, WBID 3030

Parameter	TMDL (colonies/day)	WLA		LA (% reduction)	MOS
		Wastewater (colonies/day)	NPDES Stormwater (% reduction)		
Fecal coliform	4.64×10^{10}	N/A	32%	32%	Implicit
Total coliform	2.79×10^{11}	N/A	22%	22%	Implicit

N/A – not applicable

6.2 Load Allocation

Based on a loading duration curve approach similar to that developed by Kansas (Stiles, 2002), the load allocation is a 32 percent reduction in fecal coliform from nonpoint sources and a 22 percent reduction in total coliform from nonpoint sources. It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the water management districts that are not part of the NPDES stormwater program (see **Appendix A).**

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

There are currently no NPDES-permitted wastewater facilities with fecal or total coliform limits in the Long Branch watershed. However, any future discharge permits issued in the Long Branch watershed will be required to meet Class III criteria for fecal and total coliform that will also comply with these TMDLs

6.3.2 NPDES Stormwater Discharges

The WLAs for stormwater discharges with an MS4 permit are a 32 and 22 percent reduction in current anthropogenic fecal and total coliform loadings, respectively, from the MS4. It should be noted that any MS4 permittee is only responsible for reducing the loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Department, February 2001), an implicit MOS was used in the development of these TMDLs. For fecal coliform, an implicit MOS was inherently incorporated by using 400 MPN/100mL as the water quality target for each and every sampling event, instead of setting the criterion as no more than 10 percent of samples exceeding 400 MPN/100mL. In addition, the correlation lines used to estimate current loading were fitted through only the loadings that exceeded the allowable loadings, which tends to overestimate the actual existing loading and makes the estimation of percent load reduction required more conservative, thereby adding to the MOS.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of these TMDLs by rule, the next step in the TMDL process is to develop an implementation plan for the TMDLs, referred to as the BMAP. This document will be developed over the next two years after the secretary adopted the TMDLs in cooperation with local stakeholders, who will attempt to reach consensus on detailed allocations and on how load reductions will be accomplished. The BMAP will include, among other things:

- Appropriate load reduction allocations among the affected parties,
- A description of the load reduction activities to be undertaken, including structural projects, nonstructural BMPs, and public education and outreach,
- A description of further research, data collection, or source identification needed in order to achieve the TMDLs,
- Timetables for implementation,
- Confirmed and potential funding mechanisms,
- Any applicable signed agreement(s),
- Local ordinances defining actions to be taken or prohibited,
- Any applicable local water quality standards, permits, or load limitation agreements,
- Milestones for implementation and water quality improvement, and
- Implementation tracking, water quality monitoring, and follow-up measures.

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

References

CDM (Camp Dresser & McKee Inc). 2003. *Econlockhatchee River Basin stormwater management master plan.* Prepared for Orange County, Florida.

Florida Administrative Code. *Chapter 62-302, Surface water quality standards.*

Florida Administrative Code. *Chapter 62-303, Identification of impaired surface waters.*

Florida Department of Health Web site. Available: http://www.doh.state.fl.us/environment/ostds/statistics/ostdsstatistics.htm.

Florida Department of Environmental Protection. February 2001. *A report to the governor and the legislature on the allocation of total maximum daily loads in Florida.* Tallahassee, Florida: Bureau of Watershed Management.

Florida Watershed Restoration Act. *Chapter 99-223, Laws of Florida.*

Hirsch, R. M. 1982. A comparison of four streamflow record extension techniques. *Water Resources Research, 18: 1081-1088.*

MapTech. 2000. *Fecal coliform TMDL (total maximum daily load) development for Middle Blackwater River, Virginia.* Prepared for Virginia Department of Environmental Quality and Virginia Department of Conservation and Recreation.

Stiles, T. 2002. *A simple method to define bacteria TMDLs in Kansas*. Topeka, Kansas: Kansas Department of Health and Environment.

U. S. Environmental Protection Agency. 2001. *Protocol for developing pathogen TMDLs.* First Edition. Assessment and Watershed Protection Division. EPA 841-R-00-002.

U. S. Geological Survey Web site, Available: http://waterdata.usgs.gov/usa/nwis/sw.

Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as authorized in Chapter 403, F.S., was established as a technology-based program that relies on the implementation of BMPs that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Rule 62-40, F.A.C.

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

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 stormwater permitting program 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 5 or more acres of land, and master drainage systems of local governments with a population above 100,000, which are better known as MS4s. However, because the master drainage systems of most local governments in Florida are interconnected, the EPA has implemented Phase 1 of the MS4 permitting program on a countywide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the FDOT throughout the 15 counties meeting the population criteria.

An important difference between the federal and 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 Program will expand the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 10,000 people. The 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 cannot be easily collected and treated by a central treatment facility, as are other point sources of pollution such as domestic and industrial wastewater discharges. The Department recently accepted delegation from the 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.

Appendix B: Comments from the United States Environmental Protection Agency (EPA) and responses from the Florida Department of Environmental Protection (DEP) on the Fecal and Total Coliform TMDLs for Long Branch

1. EPA comments: **In the source assessment, only septic systems are given an existing coliform load. The fecal coliform load of 5.2E+10 counts/day is over 80% of the existing load for the entire WBID (i.e., median value of 6.84E+10 counts/day, see Table 5.3.a). In the absence of loads for other significant nonpoint sources, suggest removing the load assigned to leaking septics. The existing total coliform load from leaking septic systems is 1.2E+12 counts/day and this load is greater than the existing load derived from the load duration curve (i.e., median value of 3.52E+11 counts/day, see Table 5.3.b).**

DEP response: In the source assessment, the estimates of fecal and total coliform loadings from septic tanks is the loadings created in the watershed. This loading is used to represents the possible magnitude of fecal and total coliform that could be produced potentially in the watershed. It does not represent the fecal and total coliform loadings that eventually reach the receiving waters or the in-stream load after in-stream decay processes including death, grazing, and deposition. Therefore, the loading estimates in the source assessment section should not be directly compared to the existing loadings calculated using the load duration analysis.

2. EPA comment: **In the Margin of Safety, decay is implicit in the analysis as the TMDL is based on instream samples that have undergone decay and dilution. It's probably not exactly correct to assume the analysis does not take into account decay.**

DEP response: The language is removed.

3. EPA comment **A load duration curve is used to develop the TMDL value and there are no reasons to verify the reductions using alternate approaches.**

DEP response: We provided load estimation in the Source Assessment section just to provide some general information on the relative contributions from different sources because results from the load duration analysis does not provide this type of information. Understanding the relative contributions from different sources is very important for developing the Basin Management Action Plan (BMAP) required by Florida TMDL program.

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