FINAL

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTHWEST DISTRICT • HILLSBOROUGH RIVER BASIN

TMDL Report

Fecal and Total Coliform TMDL for New River
(WBID 1442)

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September 2004

Acknowledgments

This study could not have been accomplished without significant contributions from staff in the Department's Watershed Assessment Section. David Tyler provided the basin delineation and land use aggregations, and carried out much of the data gathering. We would also like to express our appreciation to Molly Davis, Region 4 USEPA, who provided all the underlying technical analysis for this TMDL.

Editorial assistance provided by Daryll Joyner and Jan Mandrup-Poulsen.

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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

2000 305(b) Report

http://www.dep.state.fl.us/water/305b/index.htm

Criteria for Surface Water Quality Classifications

http://www/dep.state.fl.us/legal/legaldocuments/rules/ruleslistnum.htm

Basin Status Report for the Tampa Bay Tributaries Basin

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

Water Quality Assessment Report for the Tampa Bay Tributaries Basin

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, National STORET Program

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

Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for fecal and total coliforms for the New River in the Hillsborough River Basin. The river was verified as impaired for fecal and total coliforms, and was included on the Verified List of impaired waters for the Hillsborough Basin that was adopted by Secretarial Order in May 2004. The TMDL establishes the allowable loadings to the New River that would restore the waterbody so that it meets its applicable water quality criteria for fecal and total coliforms.

1.2 Identification of Waterbody

The New River is located in the southeastern portion of Pasco County and the northern portion Hillsborough County, with a 20.9 square-mile (mi^2) drainage area reaching into northern Hillsborough County **(Figure 1.1).** The river is 11.1 miles long. Major centers of population within the basin include Zephyrhills, a city of nearly 25,000 people at the east end of the basin; the City of Tampa, a city of over a 100,000 people, at the southern portion; and a regional population of nearly 3.6 million people. The New River is a dark water river, and, along its length, it exhibits characteristics associated with riverine aquatic environments. Additional information about the river's hydrology and geology are available in the Basin Status Report for the Tampa Bay Tributaries Basin (Florida Department of Environmental Protection [FDEP], 2002).

For assessment purposes, the Department divided the Hillsborough River Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. The New River has been assigned one segment, WBID 1422, as shown in **Figure 1.2,** and this TMDL addresses WBID 1422.

1.3 Background

This report was developed as part of the Florida Department of Environmental Protection's (Department) 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 fifty-two river basins over a five-year cycle, provides a framework for implementing the TMDL Program–related requirements of the 1972 federal Clean Water Act and the 1999 Florida Watershed Restoration Act (FWRA, Chapter 99-223, Laws of Florida).

Figure 1.1. Location of New River and Major Geopolitical Features in the Hillsborough River Basin

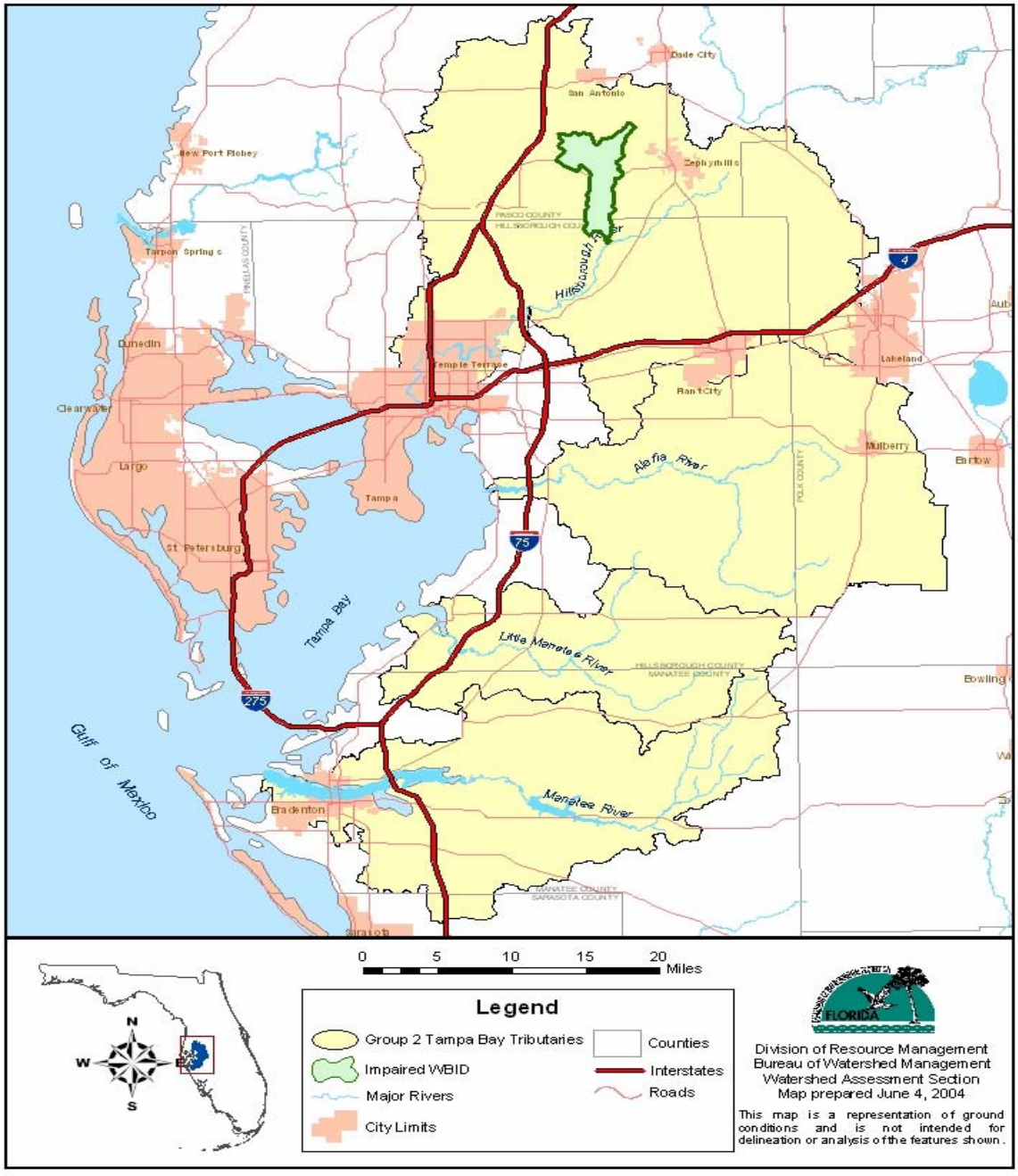
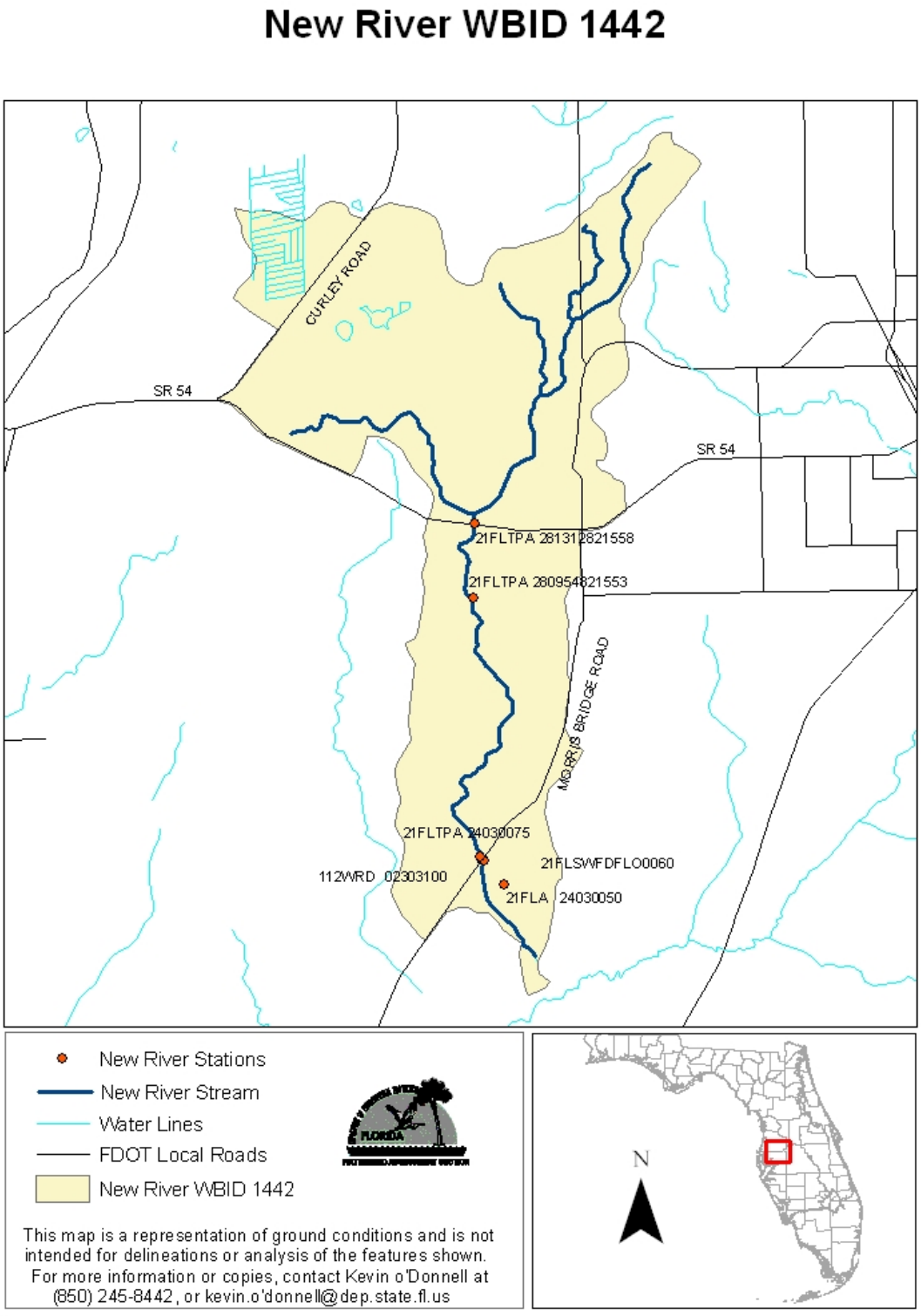


Figure 1.2. WBID in the New River



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. TMDLs 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 coliforms that caused the verified impairment of the New River. These activities will depend heavily on the active participation of the Southwest Florida Water Management District, local governments, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

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

Florida's 1998 303(d) list included 21 waterbodies in the Hillsborough River Basin. However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rule-making process, the Environmental Regulation Commission adopted the new methodology as Chapter 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 Hillsborough River Basin and verified the impairments listed in **Table 2.1**. This TMDL addresses the fecal and total coliforms impairment found in the New River. **Table 2.2** provides assessment results for fecal and total coliforms for the verification period for each waterbody segment. As shown in Table 2.2, fecal coliform exceeded water quality standards 42.8 % of the time and was on average 68.4 % greater than the applicable amount. Total coliform exceeded water quality standards 28.6 % of the time and was on average 49.4 % greater than the applicable amount.

Table 2.1. Verified Impaired Segments in the New River

WBID	Waterbody Segment	Parameters of Concern	Priority for TMDL Development	Projected Year For TMDL Development
1442	NEW RIVER	Coliforms (Fecal Coliform)	High	2003
1442	NEW RIVER	Coliforms (Total Coliform)	High	2003
1442	NEW RIVER	Dissolved Oxygen	High	2003
1442	NEW RIVER	Mercury-Fish	Low	2011

Note: The parameters listed in Table 2.1 provide a complete picture of the impairment in the river, but this TMDL only addresses Fecal and Total Coliform impairment.

Table 2.2. Summary of Fecal and Total Coliforms Data

	Number of samples	Number Violations	Percent Violations	Maximum	Average Violation
Fecal Coliform	21	9	42.8%	4300	584
Total Coliform	21	6	28.6%	8000	2026

Chapter 3. DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criteria Applicable to the TMDL

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

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

The New River is a Class III waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criteria applicable to the impairment addressed by this TMDL are the fecal and total coliform criteria.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

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

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

For both parameters, the criteria state that monthly averages shall be expressed as geometric means based on a minimum of ten samples taken over a thirty-day period. During the development of load curves for the impaired streams (as described in subsequent sections), there were insufficient data (less than 10 samples in a given month) available to evaluate the geometric mean criterion for either fecal coliform or total coliform bacteria. Therefore, the criterion selected for the TMDLs was not to exceed 400 in 10 percent of the samples for fecal coliform and not to exceed 2400 for total coliform.

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

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

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA's National Pollutant Discharge Elimination Program (NPDES). 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 Coliforms in the Hillsborough River Watershed

4.2.1 Point Sources

There are no NPDES permitted wastewater treatment facilities that discharge surface water loads either directly or indirectly into the New River.

Municipal Separate Storm Sewer System Permittees

Within the Tampa Bay Basin, the stormwater collection systems owned and operated by Plant City, Hillsborough County, and the Florida Department of Transportation for Hillsborough County are covered by an NPDES municipal separate storm sewer system (MS4) permit, FLS000006. Hillsborough County is the lead co-permittee for the New River watershed. In

October 2000, Hillsborough County drafted a watershed management plan involving berm construction, channel improvements, and structural upgrades for flood control and some water quality treatment. Other recommendations for the New River watershed included beginning a study to identify areas or sources that discharge pathogens, and beginning to provide treatment through the implementation of best management practices (BMPs) to reduce the loadings. The Hillsborough Planning and Growth Management Department is in the process of carrying out a septic tank study for the watershed that identifies the location of septic tanks, assesses their impacts on water quality, and recommends management techniques to improve their efficiency.

4.2.2 Land Uses and Nonpoint Sources

Because no major point source was identified in the New River watershed, it is reasonable to believe that the primary loadings of fecal coliform to New River are generated from nonpoint sources in the basin. Nonpoint sources of coliform bacteria generally, but not always, involve accumulation of coliform bacteria on land surfaces and wash off as a result of storm events, and contribution from ground water caused by sources such as failed septic tanks, leaking sewer lines, and improper land application of domestic wastewater residuals. Typical nonpoint sources of coliform bacteria include:

- Wildlife
- Agricultural animals
- Pets in residential area
- Onsite Sewage Treatment and Disposal Systems (septic tanks)
- Land application of domestic wastewater residual
- Urban development (outside of Phase I or II MS4 discharges)

Land Uses

The spatial distribution and acreage of different land use categories were identified using the 1999 land use coverage (scale 1:40,000) contained in the Department's GIS library. Land use categories in the watershed were aggregated using the simplified Level 1 codes tabulated in **Table 4.1. Figure 4.1** shows the acreage of the principal land uses in the watershed.

The key land uses in the watershed are devoted to agriculture, water/wetland, and urban development land uses. Agriculture occupies the largest amount of land covering over 6,500 acres of land. Water and wetlands cover over 2,000 acres, and urban development accounts for nearly 1,600 acres. All of the land uses in Table 4.2 have the potential to impact the water quality in the watershed, placing particular interest into future land uses changes that will shape the New River in the future.

Table 4.1. Classification of Land Use Categories in the New River Watershed

Code	Land Use	Acreage	Percentage
1000	Urban open	1504.5	10.36
	Low-density residential	1030.9	7.10
	Medium-density residential	34.1	0.23
	High-density residential	156.2	1.08
2000	Agriculture	6790.6	46.77
3000	Rangeland	1112.1	7.66
8000	Transportation, communication, and utilities	26.7	0.18
4000	Forest/rural open	1467.9	10.11
5000/6000	Water/wetland	2395.7	16.50

Population

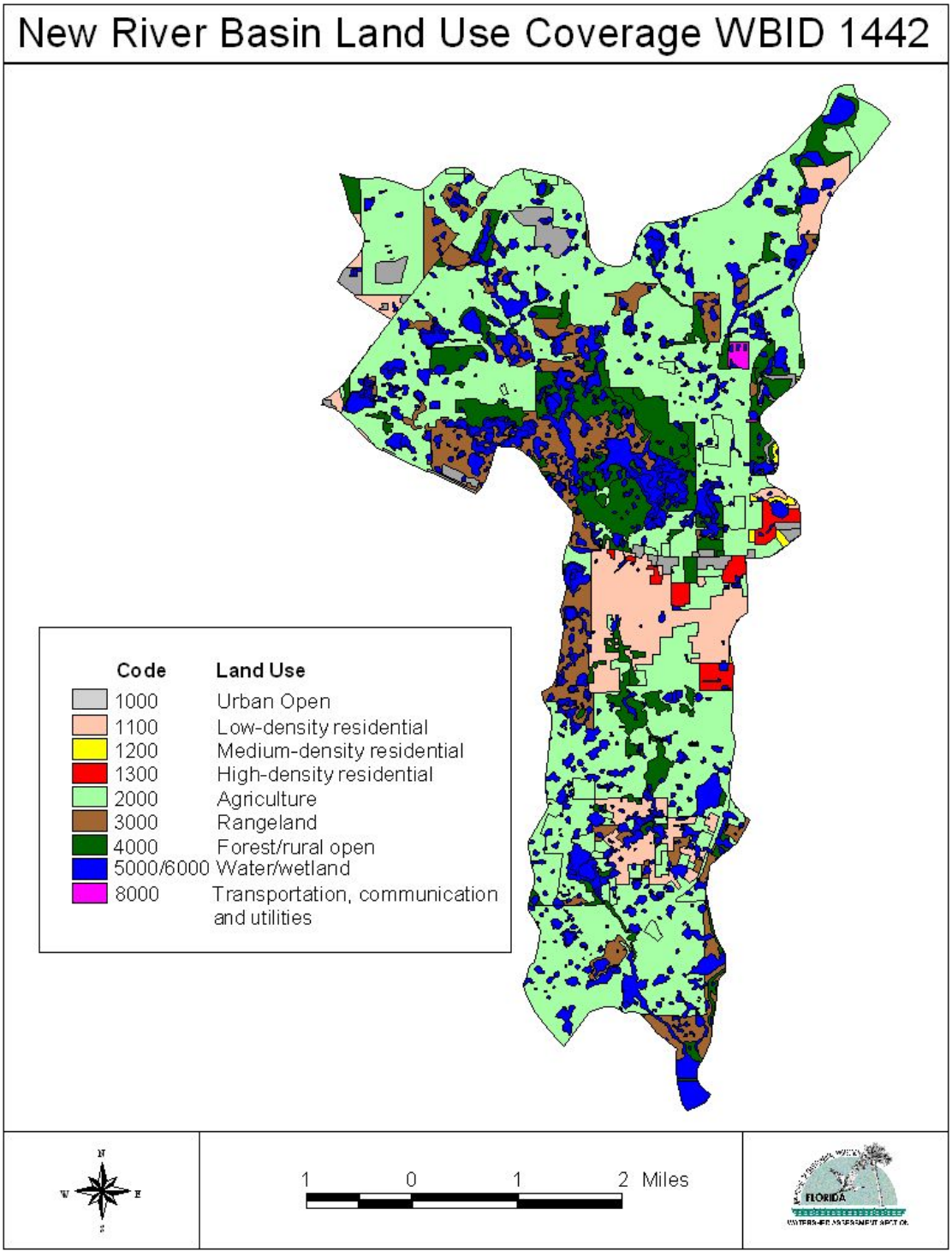
According to the U.S Census Bureau, the population density in and around WBID 1442 in the year 2000 was at or less than 462.9 people per square mile**.** The Bureau reports that the total population in Pasco County, which includes (but is not exclusive to) WBID 1442, for 2000 was 344,765, with 173,717 housing units. For all of Pasco County, the Bureau reported a housing density of 233.2 houses per square mile. This places Pasco County in the middle in housing densities in Florida (U.S. Census Bureau Web site, 2004). This is also supported by the land use, where 9.14 percent of the land use in WBID 1442 is dedicated to residences.

Septic Tanks

The following information was obtained from the state of Florida Department of Health website: http://www.doh.state.fl.us/environment/OSTDS/statistics/ostdsstatistics.htm. Data for septic tanks is based on the 2001 census results, with year by year additions based on new septic tank construction. The data does not reflect septic tanks that may have been removed.

Pasco County has a cumulative registry of 66,583 septic tanks. With 173,717 households in the county, this means that approximately 62 percent of the residences within the county are connected to wastewater treatment plants, with the rest (38 percent) utilizing septic tanks.

Figure 4.2. Principal Land Uses in the New River Watershed



Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Methodology Used

The methodology used for this TMDL is the "load duration curve." Also known as the "Kansas Approach" because it was developed by the state of Kansas, this method has been well documented in the literature, with improved modifications used by EPA Region IV. Basically, the method relates the pollutant concentration to the flow of the stream to establish the existing loading 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 load
3. Define the critical conditions
4. Establish the needed load reduction by comparing the existing load to the allowable load under critical conditions

5.2 Data Used in the Determination of the Assimilative Capacity

There are three sampling stations in WBID 1442 that have historical observations **(Figure 5.1).** The primary data collectors of historical data are the Department and the United States Geological Survey (USGS), which maintained a routine sampling site at what is commonly referred to as New River near SR 579 and New River near Zephyrhills, Florida (STORET ID: 21FLA 24030050 and 112WRD 02303100, respectively. The sites were sampled on a quarterly basis from 1951 through 1997. Recent sampling efforts have been carried out at four additional stations (21FLSWFDFL00060, 21FLTPA 24030075, 21FLTPA 280954821553, and 21FLTPA 281312821558) by the Department's Southwest District on a quarterly basis. **Figure 5.1** shows the locations of these sites, and **Table 5.1** provides a brief statistical overview of the observed data at these sites**.**

Figure 5.1. Historical Monitoring Sites in New River, WBID 1442

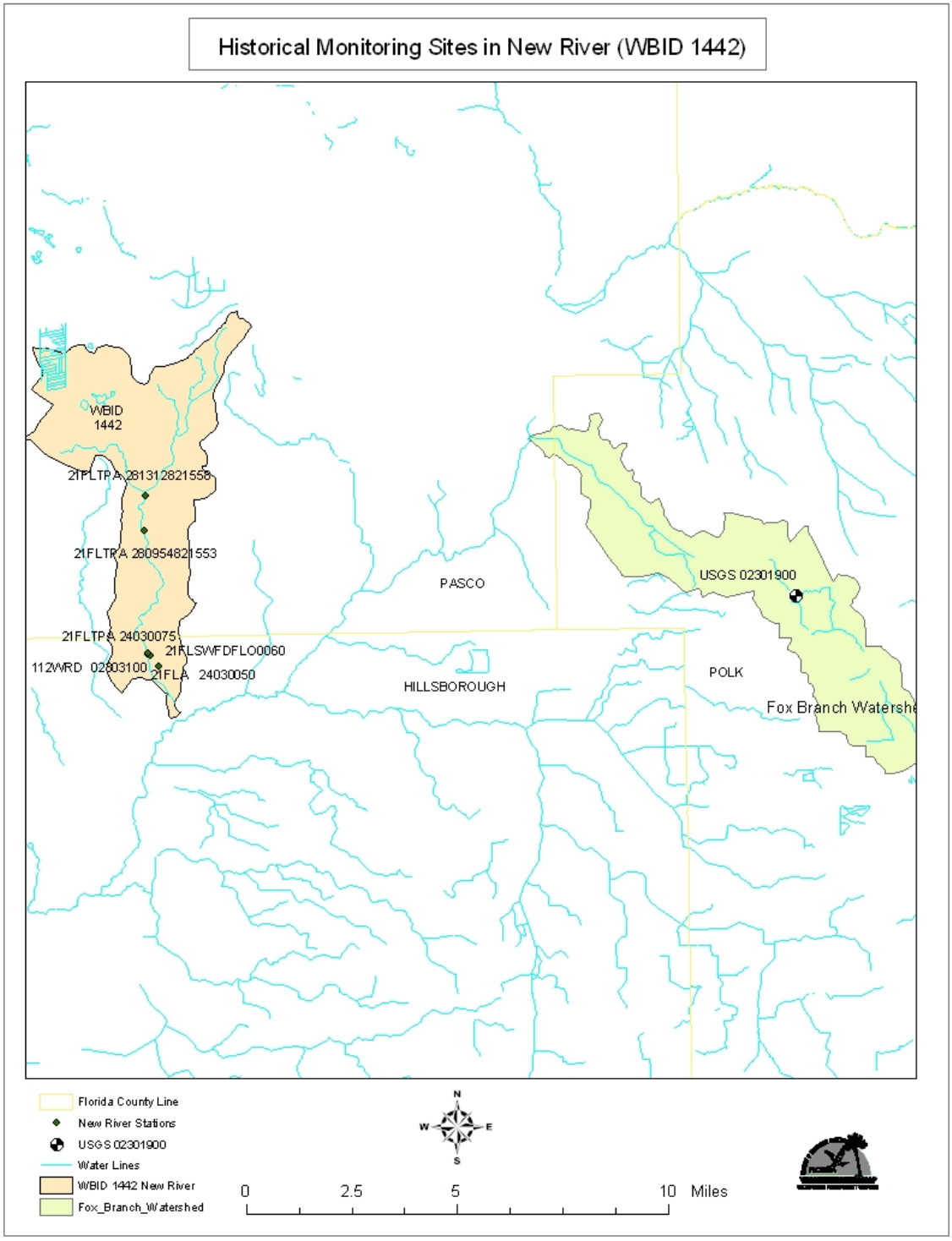


Table 5.1. Statistical Table of Observed Historical Data for New River, WBID 1442

HUC	BASIN	PARAMETER	STATION	DATE	TIME	DEPTH	RESULT
03100205	NEW RIVER	FCOLI	21FLTPA 281312821558	7/10/2002	1105	0.20	400
03100205	NEW RIVER	FCOLI	21FLTPA 281312821558	7/17/2002	135	0.50	225
03100205	NEW RIVER	FCOLI	21FLTPA 281312821558	8/7/2002	1055	0.25	10
03100205	NEW RIVER	FCOLI	21FLTPA 281312821558	9/10/2002	940	0.10	30
03100205	NEW RIVER	FCOLI	21FLTPA 281312821558	10/15/2002	1000	0.20	270
03100205	NEW RIVER	FCOLI	21FLTPA 281312821558	11/5/2002	1050	0.10	1
03100205	NEW RIVER	FCOLI	21FLTPA 280954821553	7/10/2002	1115	0.20	165
03100205	NEW RIVER	FCOLI	21FLTPA 280954821553	7/17/2002	200	1.00	**460**
03100205	NEW RIVER	FCOLI	21FLTPA 280954821553	8/7/2002	1150	0.75	370
03100205	NEW RIVER	FCOLI	21FLTPA 280954821553	9/10/2002	1000	0.10	110
03100205	NEW RIVER	FCOLI	21FLTPA 280954821553	10/15/2002	1020	0.20	**520**
03100205	NEW RIVER	FCOLI	21FLTPA 280954821553	11/5/2002	1110	0.05	20
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	2/16/1998	905	0.30	**4300**
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	9/14/1998	930	0.30	**550**
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	3/26/2002	1130	0.25	**870**
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	7/10/2002	1130	0.20	**480**
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	7/17/2002	245	1.25	**1800**
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	8/7/2002	1225	0.50	**870**
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	9/10/2002	1035	0.60	270
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	10/15/2002	1045	0.20	**530**
03100205	NEW RIVER	FCOLI	21FLTPA 24030075	11/5/2002	1210	0.10	20
03100205	NEW RIVER	FCOLI	21FLSWFDFLO0060	12/10/1992	0	1.00	**510**
03100205	NEW RIVER	FCOLI	21FLSWFDFLO0060	3/15/1993	855	1.10	**2300**
03100205	NEW RIVER	FCOLI	21FLSWFDFLO0060	6/8/1993	820	0.30	44
03100205	NEW RIVER	FCOLI	21FLSWFDFLO0060	9/15/1993	1415	0.70	**540**
HUC	**BASIN**	**PARAMETER**	**STATION**	**DATE**	**TIME**	**DEPTH**	**RESULT**
03100205	NEW RIVER	TCOLI	21FLTPA 281312821558	7/10/2002	1105	0.20	1460
03100205	NEW RIVER	TCOLI	21FLTPA 281312821558	7/17/2002	135	0.50	**4000**
03100205	NEW RIVER	TCOLI	21FLTPA 281312821558	8/7/2002	1055	0.25	1020
03100205	NEW RIVER	TCOLI	21FLTPA 281312821558	9/10/2002	940	0.10	690
03100205	NEW RIVER	TCOLI	21FLTPA 281312821558	10/15/2002	1000	0.20	720
03100205	NEW RIVER	TCOLI	21FLTPA 281312821558	11/5/2002	1050	0.10	580
03100205	NEW RIVER	TCOLI	21FLTPA 280954821553	7/10/2002	1115	0.20	1520
03100205	NEW RIVER	TCOLI	21FLTPA 280954821553	7/17/2002	200	1.00	1400
03100205	NEW RIVER	TCOLI	21FLTPA 280954821553	8/7/2002	1150	0.75	**3100**
03100205	NEW RIVER	TCOLI	21FLTPA 280954821553	9/10/2002	1000	0.10	560
03100205	NEW RIVER	TCOLI	21FLTPA 280954821553	10/15/2002	1020	0.20	600
03100205	NEW RIVER	TCOLI	21FLTPA 280954821553	11/5/2002	1110	0.05	520
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	2/16/1998	905	0.30	5
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	9/14/1998	930	0.30	2120
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	3/26/2002	1130	0.25	**4200**

03100205	NEW RIVER	TCOLI	21FLTPA 24030075	7/10/2002	1130	0.20	2300
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	7/17/2002	245	1.25	**3900**
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	8/7/2002	1225	0.50	**8000**
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	9/10/2002	1035	0.60	**3200**
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	10/15/2002	1045	0.20	920
03100205	NEW RIVER	TCOLI	21FLTPA 24030075	11/5/2002	1210	0.10	1750

Exceedances are in bold print.

5.3 Determination of Needed Percent Reduction

5.3.1 Development of 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. Because there are no gaging stations on the New River, the flow record from a nearby gaged stream, Fox Branch [USGS gage 02301900, Fox Branch Near Socrum, Florida) was used to estimate the flow for the New River by using the watershed area ratio **(Figure 5.1)**. A flow duration curve was then developed based on the estimated flows for the New River **(Figure 5.2).**

The load duration curves for fecal and total coliform were then calculated using the flows from this duration curve and the fecal and total coliform data in Table 5.1, (**Figures 5.3 and 5.4)**. The allowable load is based on the water quality numeric criterion and flow values from the flow duration curve, and the line drawn through the data points representing the allowable load is called the target line. The existing loads are based on the instream 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 geometric mean, 400 counts/100 mL was used as the target criterion for fecal coliform and 2,400 counts/100 mL was used for total coliform in this TMDL. **Figures 5.3** and **5.4** show both the allowable load and the existing load over the flow duration ranking for fecal coliform and total coliform, respectively, in the New River. The points of the existing loading that were higher than the allowable load at a given flow duration ranking were considered an exceedance of the criteria.

Figure 5.2. Flow Duration Curve for WBID 1442 based on USGS Gage **USGS 02301900 Fox Branch Near Socrum, FL**

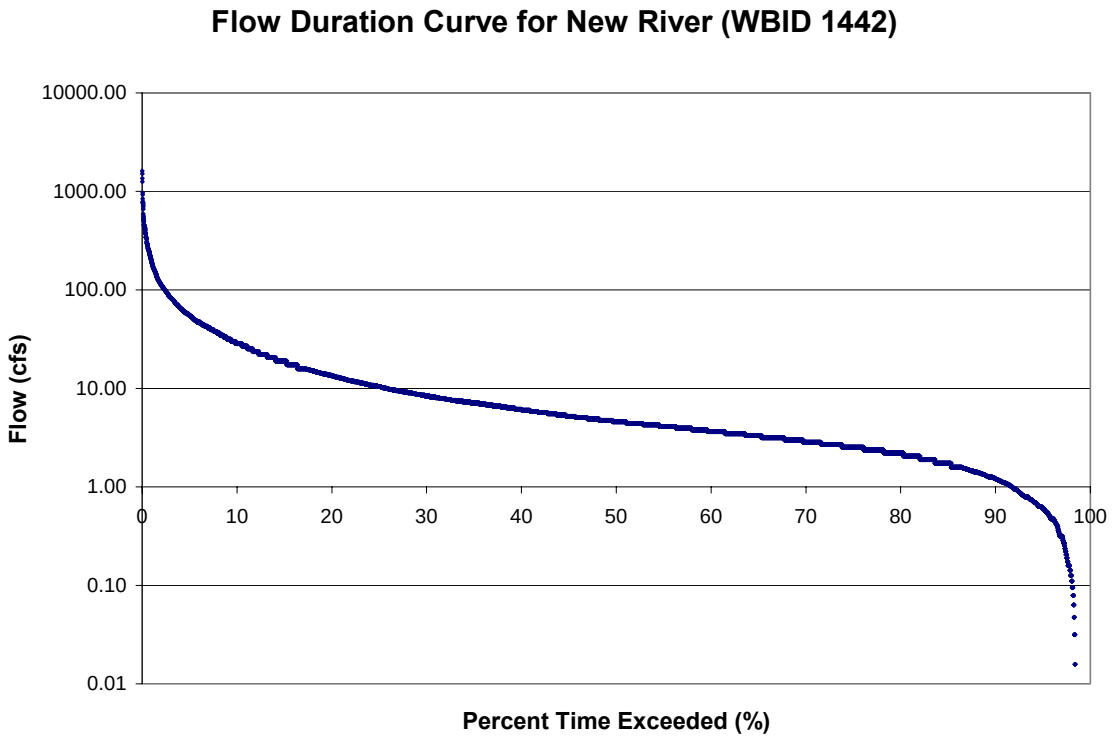


Figure 5.3. Load Duration Curve for Fecal Coliform in WBID 1442

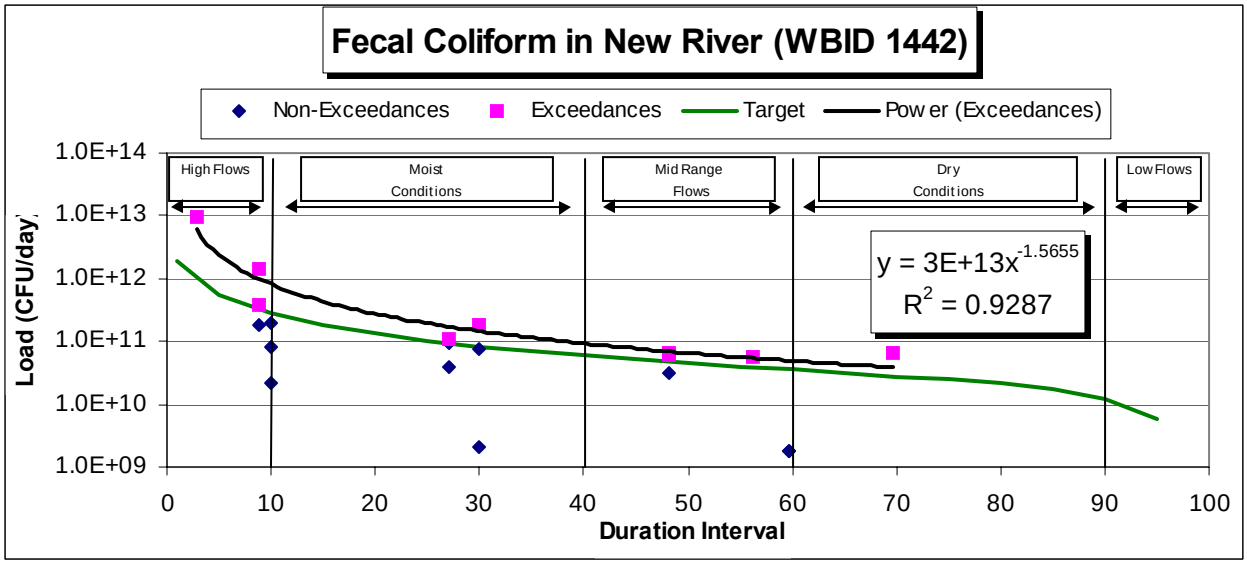
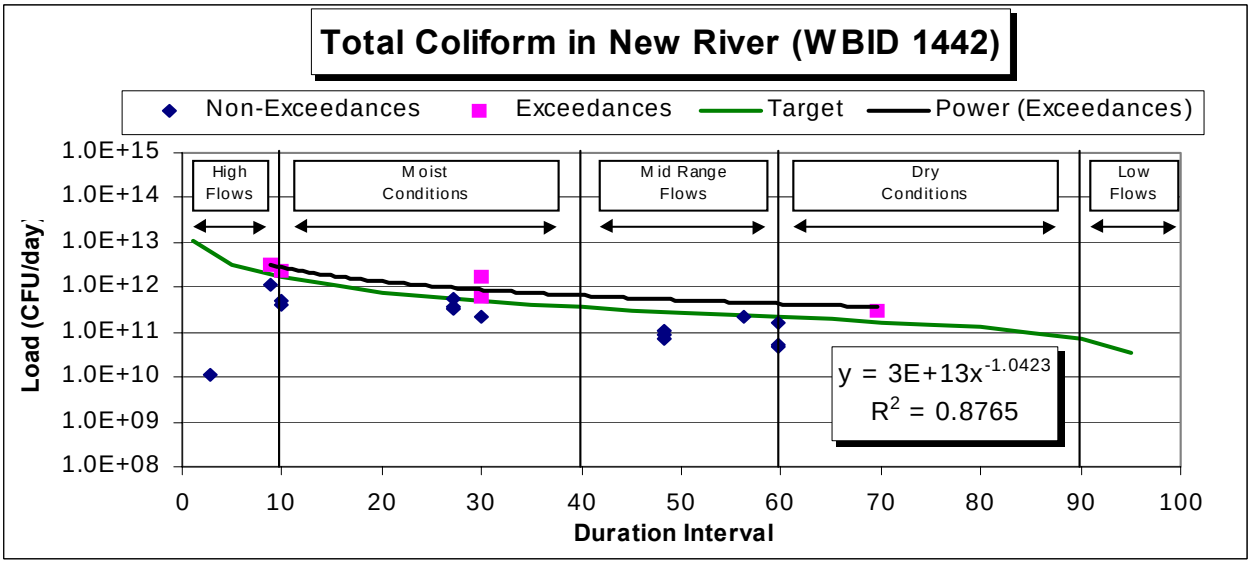


Figure 5.4. Load Duration Curve for Total Coliform in WBID 1442



As shown in **Figures 5.3** and **5.4**, the exceedances appeared during all flow regimes. In general, exceedances on the right side of the curve typically occur during low-flow events, which implies a contribution from either point sources or baseflow. In contrast, exceedances on the left side of the curve usually represent the potential sources accumulated on the land surface, which could result from the land application of biosolids, wildlife, livestock, and pets. Because there are no point sources of coliforms in the river, the exceedances under the low-flow condition imply a contribution from baseflow, which could result from leaking septic tanks or sewer lines, or the improper application of biosolids on the land surface.

5.3.2 Define the Critical Conditions/Seasonality

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

For the New River watershed, exceedances occurred during all flow conditions. Because no major point source was identified in the watershed, exceedances appearing 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 between the 10^{th} and 90^{th} intervals.

5.3.3 Establishing the Needed Load Reduction by Comparing the Existing Loading with the Allowable Load

The fecal coliform and total coliform load reductions required to achieve water quality criteria were established by comparing the existing loading with the allowable load under the critical conditions defined in the previous section. The actual needed load reduction was calculated using the following equation:

$$\textbf{(1)} \qquad \textbf{Load Reduction} = \frac{\textbf{Existing Loading} - \textbf{Allowable Loading}}{\textbf{Existing Loading}} \times 100\%$$

To estimate the existing load for a given flow condition, a regression analysis was performed to determine an equation that best represented the relationship between flow and fecal coliform loading. The best equation for fecal coliform took the form:

(2) $y = 3E+13x^{-1.5655}$, with an $R^2 = 0.9287$

A regression analysis was then performed to determine an equation that best represented the relationship between flow and total coliform loading **(Figure 5.4)**. The best equation for total coliform took the form:

(3) $y = 3E+13x^{-1.0423}$, with an $R^2 = 0.8765$

The existing loading of a given flow duration interval was then calculated using the regression equation and a given flow duration interval between the 10th and 90th percentile, in 5th percentile increments. Using **Equation (1)**, the required load reduction was then determined for each flow interval. **Tables 5.2** and **5.3** list the flow duration intervals, allowable loadings, existing loadings, and needed load reductions for fecal coliform and total coliform, respectively. The median values for the allowable load and required percent reduction were 6.03E +10 cfu/day and 35.3% for fecal coliform, and 3.62E+ 11 cfu/day and 43.6% for total coliform.

Table 5.2. Table for Calculating Needed Reduction of Fecal Coliform

Flow Ranking (percent)	Allowable Load for Fecal Coliform (counts/day)	Existing Load for Fecal Coliform (counts/day)	Percent Reduction Required
90	1.17E+10	2.62E+10	55.1
85	1.70E+10	2.86E+10	40.6
80	2.16E+10	3.15E+10	31.2
75	2.47E+10	3.48E+10	29.0
70	2.78E+10	3.88E+10	28.3
65	3.24E+10	4.36E+10	25.5
60	3.55E+10	4.94E+10	28.0
55	4.02E+10	5.66E+10	29.0
50	4.48E+10	6.57E+10	31.8
45	5.10E+10	7.74E+10	34.2
40	6.03E+10	9.31E+10	35.3
35	6.95E+10	1.15E+11	39.4
30	8.19E+10	1.46E+11	43.9
25	1.02E+11	1.94E+11	47.5
20	1.31E+11	2.76E+11	52.4
15	1.85E+11	4.32E+11	57.1
10	2.78E+11	8.16E+11	65.9
5	5.41E+11	2.41E+12	77.6
Median	6.03E+10	9.31E+10	35.3

Table 5.3. Table for Calculating Needed Reduction of Total Coliform

Flow Ranking (percent)	Allowable Load for Fecal Coliform (counts/day)	Existing Load for Fecal Coliform (counts/day)	Percent Reduction Required
90	7.05E+10	2.76E+11	74.4
85	1.02E+11	2.92E+11	65.1
80	1.30E+11	3.12E+11	58.3
75	1.48E+11	3.33E+11	55.5
70	1.67E+11	3.58E+11	53.4
65	1.95E+11	3.87E+11	49.7
60	2.13E+11	4.20E+11	49.3
55	2.41E+11	4.60E+11	47.6
50	2.69E+11	5.08E+11	47.1
45	3.06E+11	5.68E+11	46.1
40	3.62E+11	6.42E+11	43.6
35	4.17E+11	7.37E+11	43.4
30	4.91E+11	8.66E+11	43.3
25	6.12E+11	1.05E+12	41.6
20	7.88E+11	1.32E+12	40.4
15	1.11E+12	1.78E+12	37.6
10	1.67E+12	2.72E+12	38.7
5	3.24E+12	5.61E+12	42.1
Median	3.62E+11	6.42E+11	43.6

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 (Waste Load Allocations, or WLAs), nonpoint source loads (Load Allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

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

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

$$\mathbf{TMDL \cong \sum WLAs_{wastewater} + \sum WLAs_{NPDES\ Stormwater} + \sum LAs + MOS}$$

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

WLAs for stormwater discharges are typically expressed as “percent reduction” because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish loads from MS4s from other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the “maximum extent practical” through the implementation of 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**. TMDLs for the New River are expressed in terms of cfu/day and percent reduction, and represent the maximum annual fecal and total coliform load the river can assimilate and maintain the fecal and total coliform criterion **(Table 6.1).**

Table 6.1. TMDL Components for the New River

WBID	Parameter	TMDL (colonies/day)	WLA		LA (Percent Reduction)*	MOS
			Waterwater (colonies/day)	NPDES Strormwater		
1442	Fecal Coliform	6.48E+10 cfu/day	N/A	35.3	35.3	Implicit
1442	Total Coliform	3.89E+11 cfu/day	N/A	43.6	43.6	Implicit

* The percent reduction is based on 10th – 70th percentile median value of recurrence intervals minus the WLA

6.2 Load Allocation (LA)

Based on a loading duration curve approach similar to that developed by Kansas (Stiles, 2002), a fecal coliform reduction of 35.3 percent and total coliform reduction of 43.6 percent are needed from nonpoint sources. It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the water management districts that are not part of the NPDES Stormwater Program (see **Appendix A**).

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

There are no NPDES-permitted wastewater facilities that discharge coliform bacteria to surface waters in the New River watershed. Thus, the wasteload allocation for wastewater facilities is not applicable. Any future wastewater facility permitted to discharge coliform bacteria in the watershed will be required to meet permit limits and must not exceed the established TMDL values.

6.3.2 NPDES Stormwater Discharges

The WLA for stormwater discharges with an MS4 permit is a 35.3 percent reduction for fecal coliform and a 43.6 percent reduction for total coliform, which is the same percent reductions required for nonpoint sources. It should be noted that any MS4 permittee will only be 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 (MOS)

Consistent with the recommendations of the Allocation Technical Advisory Committee (FDEP, February 2001), an implicit margin of safety (MOS) was used in the development of this TMDL. An implicit MOS was provided by the development of assimilative capacity using the load duration method, which only focuses on exceedances. An additional MOS was included in the TMDL by not allowing any exceedances of state criterion, even though intermittent natural exceedances of the criterion would be expected and would be taken into account when

determining impairment. The implicit MOS is appropriate as existing loads are based on in-stream fecal coliform and total coliform measurements. These measurements include decay processes occurring in-stream and do not represent the maximum load that can be applied to the land and transported to the stream during a rain event.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the next step in the TMDL process is to develop an implementation plan for the TMDL, which will be a component of the Basin Management Action Plan (BMAP) for the Hillsborough River. This document will be developed over the next year in cooperation with local stakeholders and will attempt to reach consensus on more detailed allocations and on how load reductions will be accomplished. The BMAP will include the following:

- Appropriate allocations among the affected parties,
- A description of the load reduction activities to be undertaken,
- Timetables for project implementation and completion,
- Funding mechanisms that may be utilized,
- Any applicable signed agreement,
- Local ordinances defining actions to be taken or prohibited,
- Local water quality standards, permits, or load limitation agreements, and
- Monitoring and follow-up measures.

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Appendices

Appendix A. Background Information on Federal and State Stormwater Programs

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

The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a SWIM plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka. 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 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 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, 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 Florida Department of Transportation throughout the fifteen 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 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 cannot 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 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.

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