

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

Total Maximum Daily Load for Total Coliform Bacteria for Hatchet Creek, Alachua County, Florida WBID 2688

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1.0 INTRODUCTION

1.1 Purpose of Report

This report presents a Total Maximum Daily Load (TMDL) for Total Coliforms for Hatchet Creek (WBID 2688). The creek was verified as impaired for Total Coliforms and was included on the verified list of impaired waters for the Ocklawaha Basin that was adopted by Secretarial Order on August 28, 2002.

1.2 Identification of Waterbody

For assessment purposes, the watersheds within the Ocklawaha Basin have been broken out into smaller watersheds, with a unique **waterbody identification** (WBID) number for each. Hatchet Creek has been assigned WBID 2688 (**Figure 1**).

Hatchet Creek is located northeast of the City of Gainesville in the Orange Creek planning unit (**Figure 1**) of the Ocklawaha River Basin. Hatchet Creek is a tributary that leads to and essentially forms the headwaters of the Ocklawaha River in Alachua County and drains into Newnans Lake. It is considered a blackwater stream (low pH and high color) and is approximately 10.8 miles long and has a contributing watershed of approximately 41,285 acres. The Hatchet Creek drainage basin is considered ill-defined with interconnected drainage basins.

The diversion of Prairie Creek from Paynes Prairie to Orange Lake, and construction of the Orange Lake Weir, Newnans Lake Dam, and three major highways (U.S. Highways 301 and 441, and I-75) have altered natural flow patterns and water level fluctuations in the Orange Creek planning unit. Newnans Lake has become hypereutrophic and woody vegetation has spread over a part of Paynes Prairie as the result of some of these hydrologic alterations (SJRWMD, 2000).

The geologic formation underlying the Ocklawaha Basin and Orange Creek planning unit where Hatchet Creek is located consists of a thick sequence of primarily carbonate rocks capped by thin layers of clay, silt, and sand sediment (Scott, 1992). Fluctuations in sea level and subsequent subareal exposure contributed significantly to deposition of sediments. Contained within the carbonate rock are three aquifer systems: the Floridan, Intermediate, and Surficial Aquifers (Southeastern Geological Society, 1986).

In many parts of the basin, an intermediate confining unit separates the Florida Aquifer from the Surficial Aquifer. This unit is composed of fine-grained phosphoric sediments of the Hawthorne Formation that retard the exchange of water between the Surficial and Florida Aquifer. The Hawthorne Formation is largely absent in western Marion County and west of Gainesville. Where thick beds of permeable material are present, the Hawthorn Formation can contain an intermediate aquifer system. The Surficial Aquifer is highly variable in thickness and consists of undifferentiated deposits of silt, clay, and sand (pride et al., 1966). Karst landscape is well developed in parts of the basin, especially western Alachua County and western Marion County, with numerous faults, fractures, sinkholes, and caverns in the limestone of the Upper Florida Aquifer (Puri and Vernon, 1964). These sinkholes and fractures provide additional routes for water to move from land surface to the aquifer.

Hatchet Creek is located in the Rodman catchment landuse area. The predominant landuses in this area are tree plantations (slash pine) and mixed wetland forests. The next most significant landuses are low density residential housing, cropland/pastureland, and transportation (airport). The distribution of land cover for Hatchet Creek is based on the National Land Cover Dataset (NLCD) of 1995 and is tabulated in **Table 1**. Permitted discharges in the area include a 1.5 mgd discharge from the Florida Department of Transportation's Fairbanks ground water remediation facility that treats contaminated ground water via air stripping. Historically, Hatchet Creek was used as a disposal site for batteries from railroad crossing signals of the Sea Coast Railroad Company near the City of Waldo. There are no permitted domestic wastewater facilities in the Hatchet Creek drainage area. However, residential septic tanks in the basin are a potential source of coliforms.

Table 1. Land Cover Distribution¹

Land Cover for Hatchet Creek	Total Acres	% Distribution
Urban	416.1	2.4
Transport., Commercial, Utilities, Public ²	84.9	0.5
Agriculture	577.5	3.3
Barren Land	1,398.6	8.0
Rangeland ³	1,143.9	6.6
Forest	11,986.4	69.0
Wetlands	1,752.9	10.1
Water	20.9	0.1
Total	17,381.3	100

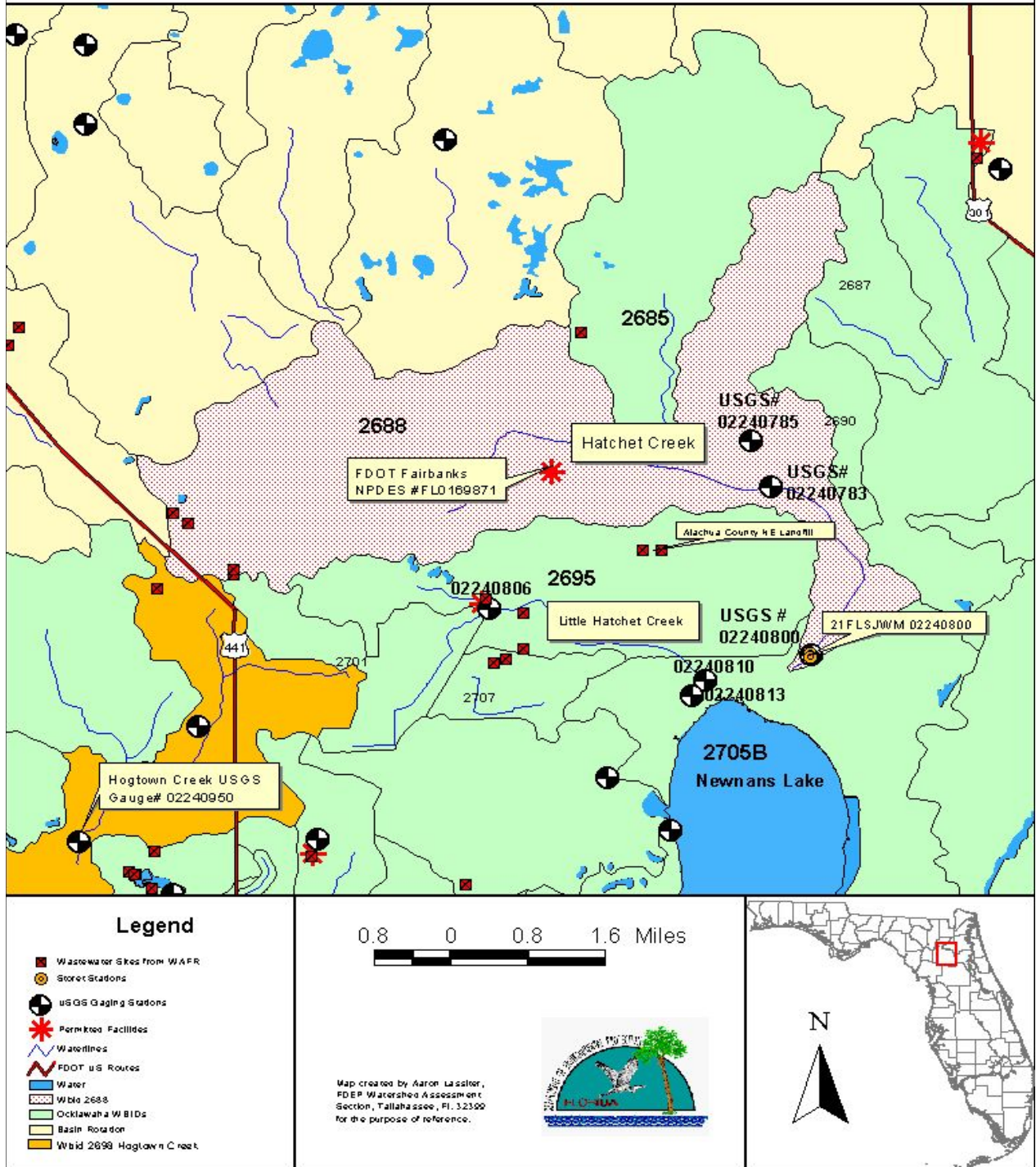
1. Acreage represents the land use distribution in the impaired WBID and not the entire drainage area.
2. Public lands include urban and recreational areas.
3. Rangeland includes shrubland, grassland, and herbaceous land covers.

2.0 STATEMENT OF PROBLEM

Hatchet Creek was listed as impaired for coliform bacteria in Florida's 1998 303(d) list of impaired waters. Through analysis according to Chapter 62-303, Florida Administrative Code (Identification of Impaired Surface Waters or IWR), Hatchet Creek was subsequently shown to meet standards for fecal coliform bacteria and this parameter was proposed for delisting. Hatchet Creek was verified impaired for total coliform bacteria and was included on the list of impaired surface waters adopted by Secretarial Order on August 28, 2002, and then submitted to EPA as part of the 2002 update to Florida's 303(d) list.

During the verified period (1995-2002), 9 out of the 19 total coliform samples from station 21FLSJWM02240800 exceeded the FDEP criterion of 2400 counts per 100 milliliters (47% exceedance rate). There was slight seasonal variability in the total coliform values, with higher averages in the fall (average of 6,025 counts/100 ml), followed by summer (average of 4,000 counts/100 ml), spring (average of 3,000 counts/100 ml), and winter (average of 2,500 counts/100 ml).

Figure 1: Hatchet Creek WBID 2688



3.0 DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND NUMERIC WATER QUALITY TARGET

Hatchet Creek is classified as a Class III water, with a designated use classification for recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criterion applicable to the observed impairment is the numeric criterion for bacterial quality for total coliform bacteria counts [Rule 62-302.530(7), F.A.C.]. The criteria have three separate components, expressed as follows:

Total Coliform Bacteria:

The most probable number (MPN) or membrane filter (MF) counts per 100 milliliters (ml) of total coliform bacteria shall be less than or equal to 1,000 as a monthly average, nor exceed 1,000 in more than 20 percent of the samples examined during any month; and less than or equal to 2,400 at any time.

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

Insufficient data were collected to base existing loads on the geometric mean criterion for total coliform bacteria. Therefore, the target for the TMDL is the one-day maximum concentration of 2,400 counts/100 ml. The TMDL represents the one day load the waterbody can transport in a 30 day period and not exceed water quality standards. Use of the one-day maximum criteria is appropriate for TMDL development because this criterion is typically violated during and/or after storm events. For coliforms, an extended dry period followed by a storm event is usually identified as the critical period when coliform levels in waterbodies exceed the water quality criteria.

4.0 ASSESSMENT OF SOURCES

4.1 Types of Sources

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

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under EPA’s National Pollutant Discharge Elimination Program (NPDES). These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites

over five acres, and from a wide variety of industries (see **Appendix A** for background information about the State and Federal Stormwater Programs).

To be consistent with Clean Water Act definitions, the term “point source” will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) AND stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see Section 5). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES stormwater discharges and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

4.2 Nonpoint Sources in the Watershed

Typical nonpoint sources of coliform bacteria include:

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

The Watershed Characterization System (WCS), a geographic information system (GIS) tool, was used to display, analyze, and compile available information to characterize potential bacteria sources in the impaired watershed. Sources of impairment include leaking collection lines or leaking septic systems during low flow events, livestock having access to streams during low flow, and rainfall events when surface and stormwater runoff and infiltration/interflow dominate.

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

4.2.1 Wildlife

Wildlife deposit coliform bacteria with their feces onto land surfaces where it can be transported during storm events to nearby streams. The bacteria load from wildlife is assumed background, as the contribution from this source is small relative to the load from urban areas. In addition, any strategy employed to control this source would probably have a negligible impact on obtaining water quality standards.

4.2.2 Agricultural Animals

Agricultural animals can be an important source of several types of coliform loading to streams. Agricultural activities, including runoff from pastureland and cattle in streams, can impact water quality. Livestock data from the 1997 Census of Agriculture for Alachua County, the location of Hatchet Creek, are listed in **Table 2**. The US Department of Agriculture is currently in the process of updating the agricultural census for 2002. Data from the 2002 Census will be released to the public in the Spring of 2004. As shown in Table 2, cattle, including beef and dairy, are the predominate livestock in the county. There are no known Confined Animal Feeding Operations (CAFOs) operating in the impaired WBID.

Table 2. Livestock Distribution by County (source: NASS, 1997)

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

(D) – Data withheld to avoid disclosing data for individual farms.

4.2.3 Onsite Sewage Treatment and Disposal Systems (Septic Tanks)

Onsite sewage treatment and disposal systems (OSTDs or septic tanks) are commonly used where providing central sewer is not cost effective or practical. When properly sited, designed, constructed, maintained, and operated, OSTDs are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTD is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, OSTDs can be a source of nutrient (nitrogen and phosphorus), pathogens, and other pollutants to both ground water and surface water. **Table 3** summarizes the number of septic systems in Alachua County and provides estimates of countywide failure rates and total daily discharge of wastewater from septic tanks.

Table 3. County Estimates of Septic Tanks (FDEP, 2001)

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

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

4.2.4 Urban Development

Coliform loading from urban areas is attributable to multiple sources including storm water runoff, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, runoff from improper disposal of waste materials, leaking septic systems, and domestic animals.

4.3 Point Sources

As noted in Section 1.2, there is one permitted wastewater facility that discharges directly into Hatchet Creek. Florida Department of Transportation's Fairbanks facility, NPDES# FL0169871, located at 29 43' 36" latitude, 82 15' 55" longitude, is a ground water remediation facility that is

permitted for a 1.5 MGD discharge. The facility has two discharge locations: outfall 0001-1 and 01A-1. Outfall 0001-1 has a monthly average discharge of 0.17 MGD and outfall 01A-1 a monthly average discharge of 0.28 MGD. The facility has been operational since March of 1997 and does not discharge coliform bacteria to surface waters in the Hatchet Creek basin.

There are currently no NPDES Stormwater MS4 areas overlapping the Hatchet Creek watershed.

5.0 LOADING CAPACITY- LINKING WATER QUALITY AND POLLUTANT SOURCES

5.1 Determination of Assimilative Capacity

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on the relationship between pollution sources and in-stream water quality conditions. The load duration curve methodology was used to calculate the total coliform TMDL for Hatchet Creek. Load duration curves provide a data-based method to estimate the reductions required to meet water quality standards. Load duration curves are based on cumulative frequency distribution of stream flow.

A statistical summary of the coliform data used in the TMDL for Hatchet Creek is shown in **Table 4**. Data used to compile the statistics shown in **Table 4** are included in **Appendix B**. Water quality data collected at station 21FLSJWM02240800 (**Figure 1**) were used to estimate the total coliform TMDL for Hatchet Creek because it had the largest amount of data available. Flow at the time of sampling was estimated using a weighted drainage area ratio to flows measured at the Hogtown Creek, USGS gage 02240950.

Table 4. Summary of Total Coliform Monitoring Data

WBID	Total Number Samples	30-Day Geometric Mean	% Samples > 2,400 counts/100mL	Minimum Concentration (counts/100MI)	Maximum Concentration (counts/100mL)
2688	19	N/A	47.4	20	9,000

5.2 Flow Duration Curve Methodology

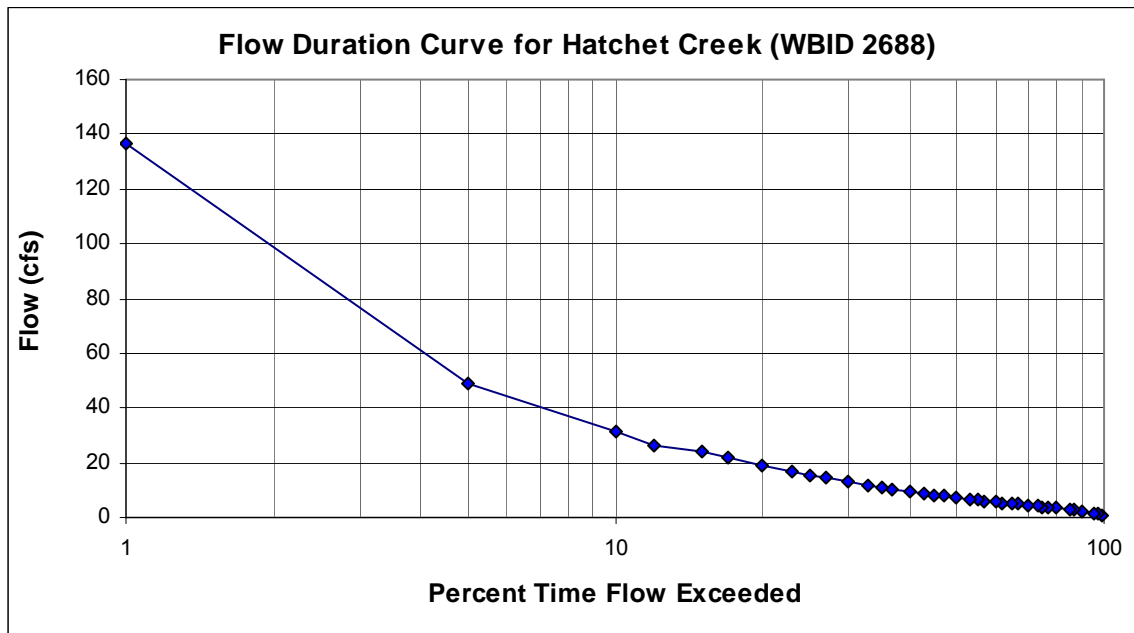
The first step in the development of load duration curves is to create flow duration curves. A flow duration curve displays the cumulative frequency distribution of daily flow data over the period of record. The duration curve relates flow values measured at a monitoring station to the percent of time the flow values were equaled or exceeded. Flows are ranked from low, which are exceeded nearly 100 percent of the time, to high, which are exceeded less than 1 percent of the time.

Because a continuous flow record is not available for Hatchet Creek, the “drainage area ratio method” was used to estimate flows for the creek from a nearby gaged stream (Hogtown Creek). In accordance with USGS protocol, the drainage area method may be used to estimate flows when the drainage area for the ungaged site (Hatchet Creek) is within 0.5 and 1.5 times the drainage area of the gaged site (personal communication, USGS, 2002). This approach is

valid when the two streams have similar topography, slope, watershed size (ratio of area of the ungaged site to the area of the gaged site is within 0.5 to 1.5), groundwater interaction, and are in the same ecoregion. The ratio between Hatchet Creek and Hogtown Creek ratio is 0.9, within the range of 0.5 and 1.5. As a result, flows on Hatchet Creek were estimated based on a weighted drainage area ratio to flows in Hogtown Creek.

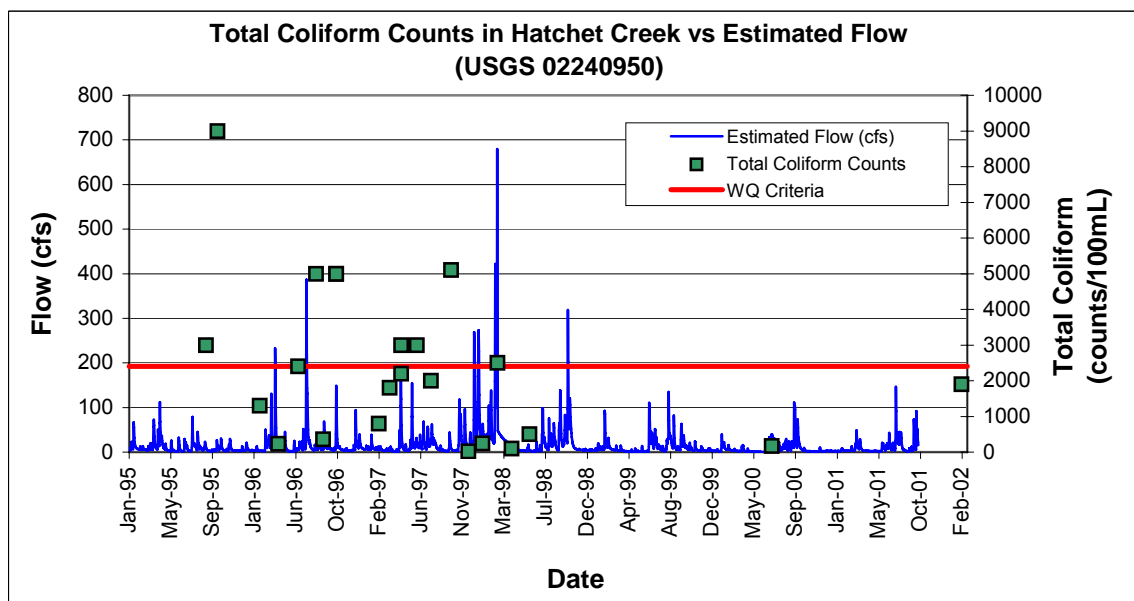
Continuous flow measurements (1/1/1995 to 2/11/2002) taken from USGS gage 02240950, Hogtown Creek, were used to develop the flow duration curve for this TMDL (**Figure 2**). The estimated flow from the Hogtown Creek USGS gage and associated total coliform data in Hatchet Creek are shown in **Figure 3**.

Figure 2. Flow Duration Curve for Hatchet Creek (USGS 02240950)



Note: Flows within the duration interval of 1 to 10 represent high flows (i.e., not a high probability of being exceeded) and flow within the duration interval of 90-100 represent low flows (i.e., have a high probability of being exceeded).

Figure 3. Flow and Total Coliform in Hatchet Creek



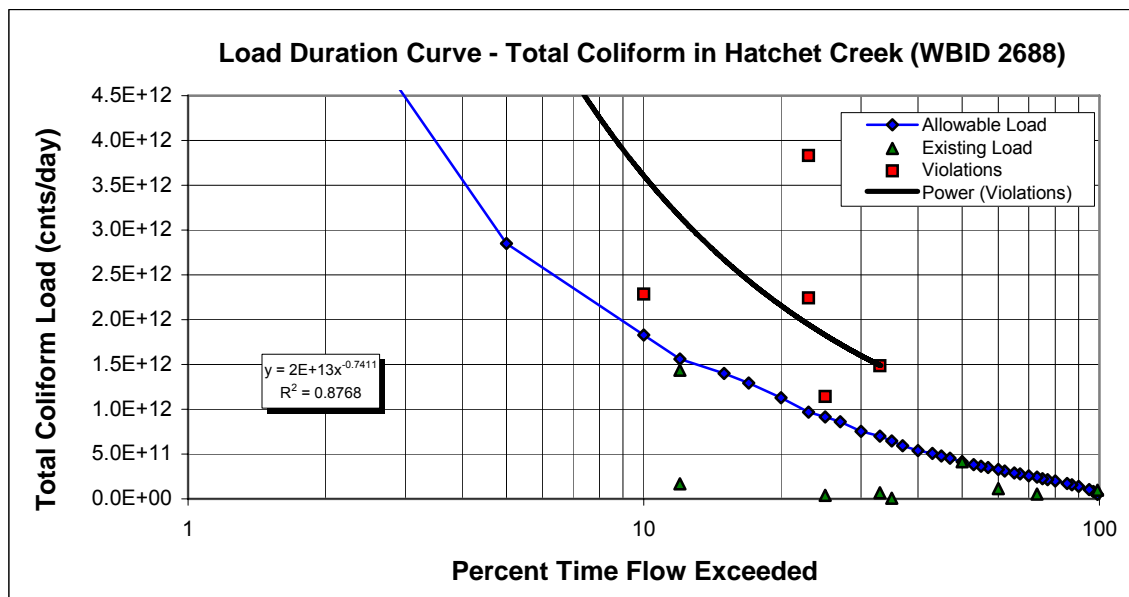
5.3 Load Duration Curve Methodology

The load duration curve methodology was used to calculate the total coliform TMDL for Hatchet Creek. Load duration curves provide a data-based method to estimate the reductions required to meet water quality standards. Load duration curves are based on cumulative frequency distribution of stream flow.

Flow duration curves are transformed into load duration curves by multiplying the flow values along the flow duration curve by the coliform concentration and the appropriate conversion factors. On the load duration curve, allowable and existing loads are plotted against the flow recurrence interval. The allowable load is based on the water quality numeric criterion and flow values from the flow duration curve. The line drawn through the data points representing the allowable load is called the target line.

The existing load is based on measured coliform concentrations and an estimate of flow in the stream at the time of sampling. The positioning of the existing load on the curve is based on the recurrence interval of the estimated flow value used to calculate the existing load. Existing loads that plot above the target line indicate an exceedance of the water quality criterion, while loads plotting below the line represent values meeting the criterion. The load duration curve for Hatchet Creek is shown in **Figure 4**.

Figure 4. Load Duration Curve for Hatchet Creek



The positioning of monitoring data on the load duration curve provides an indication of the potential sources and delivery mechanisms of the pollutant. In general, exceedances occurring on the right side of the curve typically occur during low flow events and are indicative of continuous pollutant sources, such as NPDES permitted discharges, leaking collection lines, or leaking septic systems. Livestock having access to streams could also be a source during low flow (it is not expected that livestock would be in the stream during high flows). Exceedances that occur on the left side of the curve occur during high flow events and are indicative of

sources responding to rainfall events. As shown in **Figure 4**, water quality violations occur during both high and low flow events (i.e., flows exceeded between 5 to 70 percent of time). Potential sources in this range are in response to rainfall events when surface runoff and infiltration/interflow dominate.

Figure 4 includes a trend line (black line) drawn through the data points representing water quality exceedances. This trend line is used to predict the load at other flow recurrence intervals. For Hatchet Creek, a power function trendline equation ($y = 2E + -0.7411$) reflected the best visual fit of the data and had the highest correlation coefficient (R^2 value = 0.8768). The correlation factor provides an indication of how well the equation of the line represents the data.

After the trend line is developed, it is used to determine the average percent reduction required to achieve the numerical criterion. At each recurrence interval between 10 and 90 (using recurrence intervals in multiples of 5), the equation of the trend line is used to estimate the existing load. Values for flows that are exceeded less than 10 percent of the time were not used because they represent abnormally high events and values for flows occurring greater than 90 percent of the time were not used because they are extreme low flow events.

The percent reduction required to achieve the target load is then calculated at each interval and the final percent reduction needed is the average of these values (**Table 5**). The 62 percent reduction is based on the average existing load and average allowable load. A more detailed description of the method for estimating percent reduction is provided in **Appendix C**.

Table 5. Calculation of TMDL for Total Coliform in Hatchet Creek

Interval	Allowable Load (counts/day)	Existing Load ¹ (counts/day)	Percent Reduction
90	1.40E+11	7.12E+11	80.4
85	1.72E+11	7.43E+11	76.8
80	1.99E+11	7.77E+11	74.4
75	2.26E+11	8.15E+11	72.3
70	2.58E+11	8.58E+11	69.9
65	2.90E+11	9.07E+11	68.0
60	3.28E+11	9.62E+11	65.9
55	3.66E+11	1.03E+12	64.4
50	4.14E+11	1.10E+12	62.4
45	4.79E+11	1.19E+12	59.8
40	5.38E+11	1.30E+12	58.6
35	6.46E+11	1.43E+12	55.0
30	7.53E+11	1.61E+12	53.2
25	9.15E+11	1.84E+12	50.3
20	1.13E+12	2.17E+12	48.0
15	1.40E+12	2.69E+12	48.0
10	1.83E+12	3.63E+12	49.6
Average Values	5.93E+11	1.40E+12	6.22E+01

1. Existing loads based on the power function trendline equation shown in Figure 4.

6.0 CRITICAL CONDITIONS

The critical condition for coliform loadings from nonpoint sources is an extended dry period followed by a rainfall runoff event. During the dry weather period, coliform bacteria builds up on the land surface, and is washed off by rainfall. The critical condition for point source loading occurs during periods of low stream flow when dilution is minimized. Water quality data have been collected during both time periods. Most of the exceedances occur during median to high flow conditions. Critical conditions are accounted for in the load curve analysis by using the complete period of flow records and water quality data available for the stream. Based on the location of the majority of water quality exceedances on the load curve (between the 10th and 40th duration interval) runoff during wet weather events is the probable delivery mode (see Figure 4).

7.0 DETERMINATION OF TMDL

A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations), non-point source loads (Load Allocations), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

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

The objective of a TMDL is to allocate loads among all of the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time (e.g. pounds per day), toxicity, or other appropriate measure. The total coliform TMDL for Hatchet Creek (WBID 2688) is expressed in terms of counts per day, and represent the maximum one-day load the stream can assimilate over a 30-day period and maintain the water quality criterion. TMDL components for Hatchet Creek are provided in **Table 6**.

Table 6. TMDL Components

WBID 2688 (Hatchet Creek)	WLA (Counts/day)	LA (Counts/day)	MOS	TMDL ¹ (Counts/day)	Percent Reduction ²
Total Coliform	N/A	5.93E + 11	Implicit	5.93E + 11	62.2

1. TMDL represents the average allowable load between the 10th and 90th percent recurrence interval.

2. Overall reduction to achieve an in-stream water quality criterion of 2,400 counts/100ml.

7.1 Load Allocations (LA)

The load allocation (LA) component represents the maximum one-day load that can occur in any 30-day period. As there are no point sources in this segment, the entire TMDL has been allocated to the LA. Nonpoint sources will need to reduce loading by 62 percent to meet the TMDL.

7.2 Wasteload Allocations (WLA)

The WLA component is typically separated into a load from continuous NPDES wastewater facilities (e.g., WWTP) and the load from Municipal Separate Storm Sewer Systems (MS4s). Continuous discharge facilities have WLA units of counts/day based on permit limits and design flow, while MS4 loads are typically represented as a percent reduction. Currently, no MS4 area is overlapping the Hatchet Creek watershed, and no stormwater loads were assigned to the WLA. There are no NPDES permitted facilities that discharge “coliform bacteria” to surface waters in the Hatchet Creek basin and the wasteload allocation is zero.

However, if there are future changes to the Gainesville/Alachua County MS4 area that would result in the inclusion of Hatchet Creek, then a WLA based on the percent reduction of the total coliform loading to the creek would need to be assigned to the MS4. Any future wastewater facility permitted to discharge coliform bacteria in the Hatchet Creek watershed shall be required to meet permit limits and must not exceed the established TMDL values. For future facilities discharging into the basin, nonpoint source loads shall be reduced such that the combined WLA and LA do not exceed the established TMDL.

MS4s typically discharge bacteria to waterbodies in response to storm events. Large and medium MS4s serving populations greater than 100,000 people have been required to obtain an NPDES storm water permit for several years under Phase I of the program. As of March 2003, small MS4s serving urbanized areas with a residential population of at least 50,000 people and an overall population density of 1,000 people per square mile are required to obtain a permit under the Phase II storm water regulations.

7.3 Margin of Safety (MOS)

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

8.0 IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

Following 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 for the Hatchet Creek basin. This document will be developed in cooperation with local stakeholders and will attempt to reach consensus on more detailed allocations and on how load reductions will be accomplished.

The Basin Management Action Plan (B-MAP) will include:

- 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 agreements.
- Local ordinances defining actions to be taken or prohibited.
- Local water quality standards, permits, or load limitation agreements.
- Monitoring and follow-up measures.

It should be noted that TMDL development and implementation is an iterative process, and this TMDL will be re-evaluated during the BMAP development process and subsequent Watershed Management cycles. The Department acknowledges the uncertainty associated with TMDL development and allocation, particularly in estimates of nonpoint source loads and allocations for NPDES stormwater discharges, and fully expects that it may be further refined or revised over time. If any changes in the estimate of the assimilative capacity and/or allocation between point and nonpoint sources are required, the rule adopting this TMDL will be revised, thereby providing a point of entry for interested parties.

9.0 SEASONAL VARIATION

Seasonal variation was incorporated in the load curves by using the entire period of record of flow recorded at the gage. Seasonality was also addressed by using all water quality data collected near the USGS flow gage, which was collected during multiple seasons.

Appendix A

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

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

In 1987, the U.S. Congress established section 402(p) as part of the Federal Clean Water Act Reauthorization. This section of the law amended the scope of the federal NPDES to designate certain stormwater discharges as “point sources” of pollution. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific Standard Industrial Classification (SIC) codes, construction sites disturbing five or more acres of land, and master drainage systems of local governments with a population above 100,000 [which are better known as “municipal separate storm sewer systems” (MS4s)]. However, because the master drainage systems of most local governments in Florida are interconnected, EPA has implemented Phase 1 of the MS4 permitting program on a county-wide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the DOT (Department of Transportation) throughout the 15 counties meeting the population criteria.

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

Appendix B – Water Quality Data

Hatchet Creek Total Coliform TMDL Data							
WBID	Basin/ Waterbody	Station ID	Date	Total Coliform (counts/100mL)	Est. Flow (CFS)	Flow Probability	Load (counts/day)
2688	Hatchet Creek	21FLSJWM02240800	11/24/1997	20	11.02	35	5.38E+09
2688	Hatchet Creek	21FLSJWM02240800	4/8/1998	100	15.61	25	3.81E+10
2688	Hatchet Creek	21FLSJWM02240800	4/10/1996	230	11.94	33	6.70E+10
2688	Hatchet Creek	21FLSJWM02240800	1/7/1998	240	28.47	12	1.67E+11
2688	Hatchet Creek	21FLSJWM02240800	6/3/1998	500	4.32	73	5.27E+10
2688	Hatchet Creek	21FLSJWM02240800	2/18/1997	800	5.88	60	1.15E+11
2688	Hatchet Creek	21FLSJWM02240800	2/12/1996	1300	3.03	99	9.62E+10
2688	Hatchet Creek	21FLSJWM02240800	7/30/1997	2000	29.39	12	1.43E+12
2688	Hatchet Creek	21FLSJWM02240800	4/29/1997	2200	119.39	5	6.41E+12
2688	Hatchet Creek	21FLSJWM02240800	6/11/1996	2400	7.07	50	4.14E+11
2688	Hatchet Creek	21FLSJWM02240800	2/23/1998	2500	679.62	1	4.15E+13
2688	Hatchet Creek	21FLSJWM02240800	8/28/1995	3000	15.61	25	1.14E+12
2688	Hatchet Creek	21FLSJWM02240800	4/28/1997	3000	173.58	1	1.27E+13
2688	Hatchet Creek	21FLSJWM02240800	6/16/1997	3000	31.23	10	2.29E+12
2688	Hatchet Creek	21FLSJWM02240800	8/6/1996	5000	18.37	23	2.24E+12
2688	Hatchet Creek	21FLSJWM02240800	10/8/1996	5000	148.78	1	1.82E+13
2688	Hatchet Creek	21FLSJWM02240800	10/8/1996	5000	148.78	1	1.82E+13
2688	Hatchet Creek	21FLSJWM02240800	10/1/1997	5100	11.94	33	1.49E+12
2688	Hatchet Creek	21FLSJWM02240800	10/3/1995	9000	17.45	23	3.83E+12

2688 Data Analysis			
Station	# samples Collected	# samples >2400	Percentage
21FLSJWM02240800	19	9	47.4

The TMDL and existing load values represent average loads between the 10th and 90th percentile of flow.

TMDL Load (counts/day): 5.93E+11 (based on the one day maximum concentration < 2400 counts/100mL).

Existing Load (counts/day): 1.40E+12 (based on the power function trendline equation).

Percent Reduction: 62.2 (based on the average existing load and average allowable load).

Appendix C – Load Curve Analysis

The load duration curve is a visual display of the existing and allowable loads at each recurrence interval on the flow duration curve. The existing loads are based on the instream total coliform concentrations measured during ambient monitoring and an estimate of flow in the stream at the time of sampling. Allowable loads are based on the flow values at each recurrence interval on the flow duration curve and the applicable water quality criterion. Because insufficient data were collected to evaluate the geometric mean criterion for total coliforms, the numerical criterion of 2,400 counts per 100 ml was addressed in this TMDL. The load duration curve for Hatchet Creek (WBID 2688) is shown in Figure 4.

The existing loads are separated into two groups depending on whether they violate the numerical target or not. These groups of existing loads are shown as unique symbols on the plots. The position of the loads on the curve is based on the recurrence interval of the stream flow estimated at the time of sampling. Loads are expressed in units of counts per day to reflect the instantaneous criterion. The loads represent the maximum one-day load that can occur in any 30-day period for the stream to maintain water quality standards.

Depending on the number of samples violating the target, a trendline was drawn through these points. If fewer than two samples collected on an impaired stream violated the target, a trendline was not drawn. A power function trendline was used for Hatchet Creek as it reflected the best visual fit of the data and had the highest correlation coefficient (R^2 value). In the trendline equation, the x-variable is the recurrence interval.

The load allocation for Hatchet Creek was calculated using the power function trendline equation. The load calculated using the trendline equation is called the existing load. At each recurrence interval, if the existing load is greater than the target load, a percent reduction is required to meet the water quality criterion. The TMDL and percent reductions were calculated as the average of all the loads and percent reductions calculated at the various recurrence intervals where a violation occurred.

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