FINAL

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

NORTHWEST DISTRICT • APALACHICOLA-CHIPOLA BASIN

TMDL Report

Fecal Coliform TMDL for Huckleberry Creek

(WBID 1286)

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Florida Department of Environmental Protection, Bureau of Watershed Management

TMDL Program

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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

2002 305(b) Report

http://www.dep.state.fl.us/water/docs/2002_305b.pdf

Criteria for Surface Water Quality Classifications

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

Basin Status Report for the Apalachicola–Chipola Basin

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

Water Quality Assessment Report for the Apalachicola–Chipola 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

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 Load (TMDL) for fecal coliform for Huckleberry Creek in the Apalachicola-Chipola Basin. The river was verified as impaired for fecal coliform, and was included on the Verified List of impaired waters for the Apalachicola-Chipola Basin that was adopted by Secretarial Order on May 27, 2004. Huckleberry Creek is located in a coastal area of Franklin County **(Figure 1.1).** The TMDL establishes the allowable loadings to the Huckleberry Creek that would restore the waterbody so that it meets its applicable water quality criterion for fecal coliform.

1.2 Identification of Waterbody

Huckleberry Creek, located in Franklin County, is a small tributary to the Jackson River, which is a tributary to the Apalachicola River near the city of Apalachicola **(Figure 1.1).** The creek is about 3.38 miles long from Moses Road to the Jackson River, has a water surface area of approximately 0.0568 square miles, and has a total drainage area at the mouth to the Jackson River of 7.7 square miles. Major centers of population in the basin include Apalachicola, a city of 2,334 at the southwest end of the Apalachicola–Chipola Basin; Eastpoint, a city of 1,577 at the southeast; and several small cities along the Apalachicola River and Chipola Rivers to the north. Huckleberry Creek is a first-order, darkwater stream, and, along its length, it exhibits characteristics associated with riverine aquatic environments. On some older maps, it was named Whortleberry Creek. Additional information about the river's hydrology and geology are available in the Basin Status Report for the Apalachicola–Chipola Basin (Florida Department of Environmental Protection, 2001).

For assessment purposes, the Florida Department of Environmental Protection (the Department) has divided the Apalachicola–Chipola Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. Huckleberry Creek has been assigned WBID 1286, as shown in **Figure 1.2.**   While the entire creek is contained within WBID 1286, the creek was further subdivided into segments. The Upper Segment is defined as the reach from the headwaters at the airport to the Apalachicola STP discharge point, the Middle Segment is defined as the Apalachicola STP discharge point at Huckleberry Swamp to Moses Rd, and the Lower Segment consists of the reach from Moses Road to the Jackson River. In addition, several named tributaries (Tilton Creek and Pine Log Creek) and unnamed tributaries are included within WBID 1286.

Figure 1.1. Location of Huckleberry Creek and Major Geopolitical Features in the Apalachicola–Chipola Basin

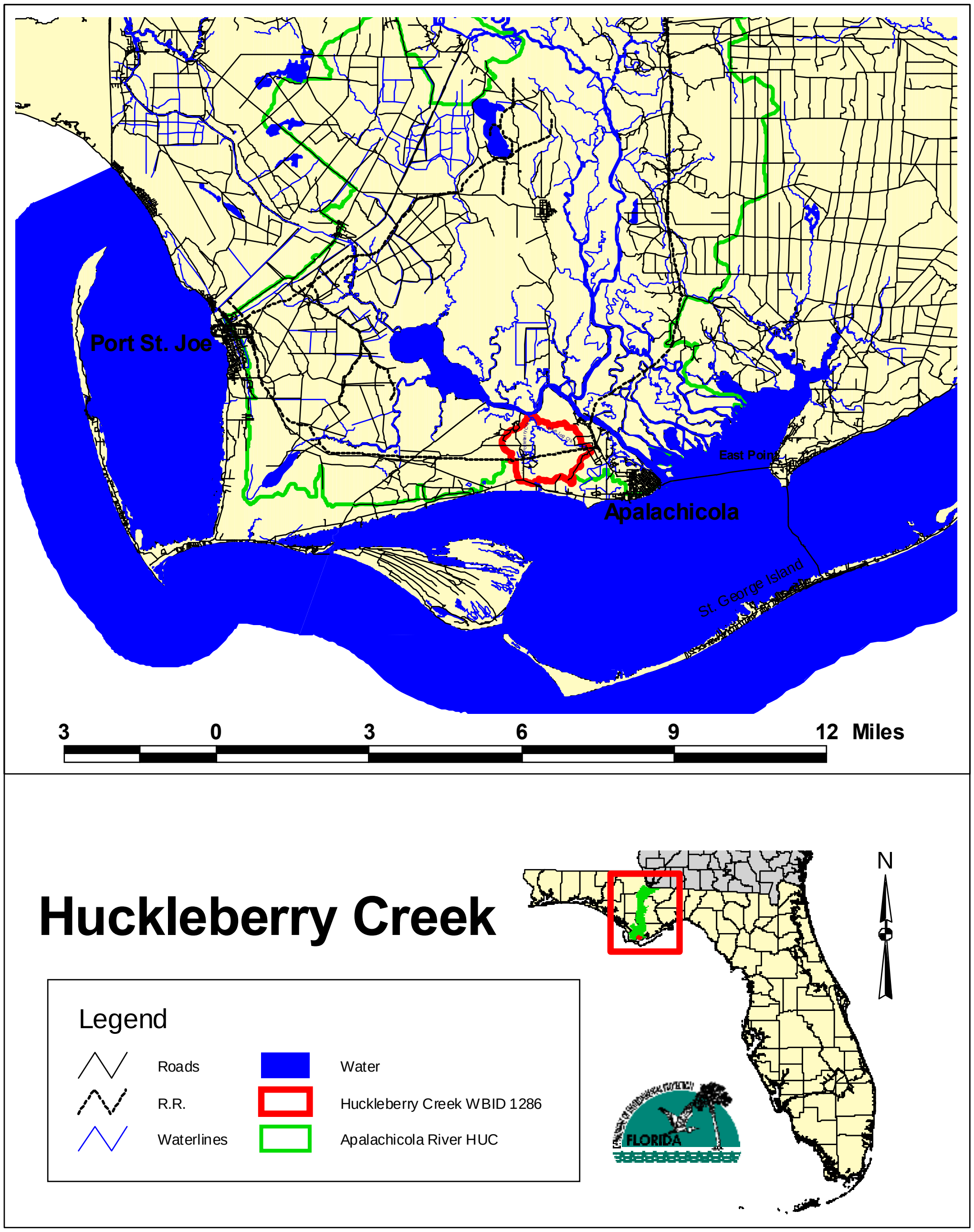
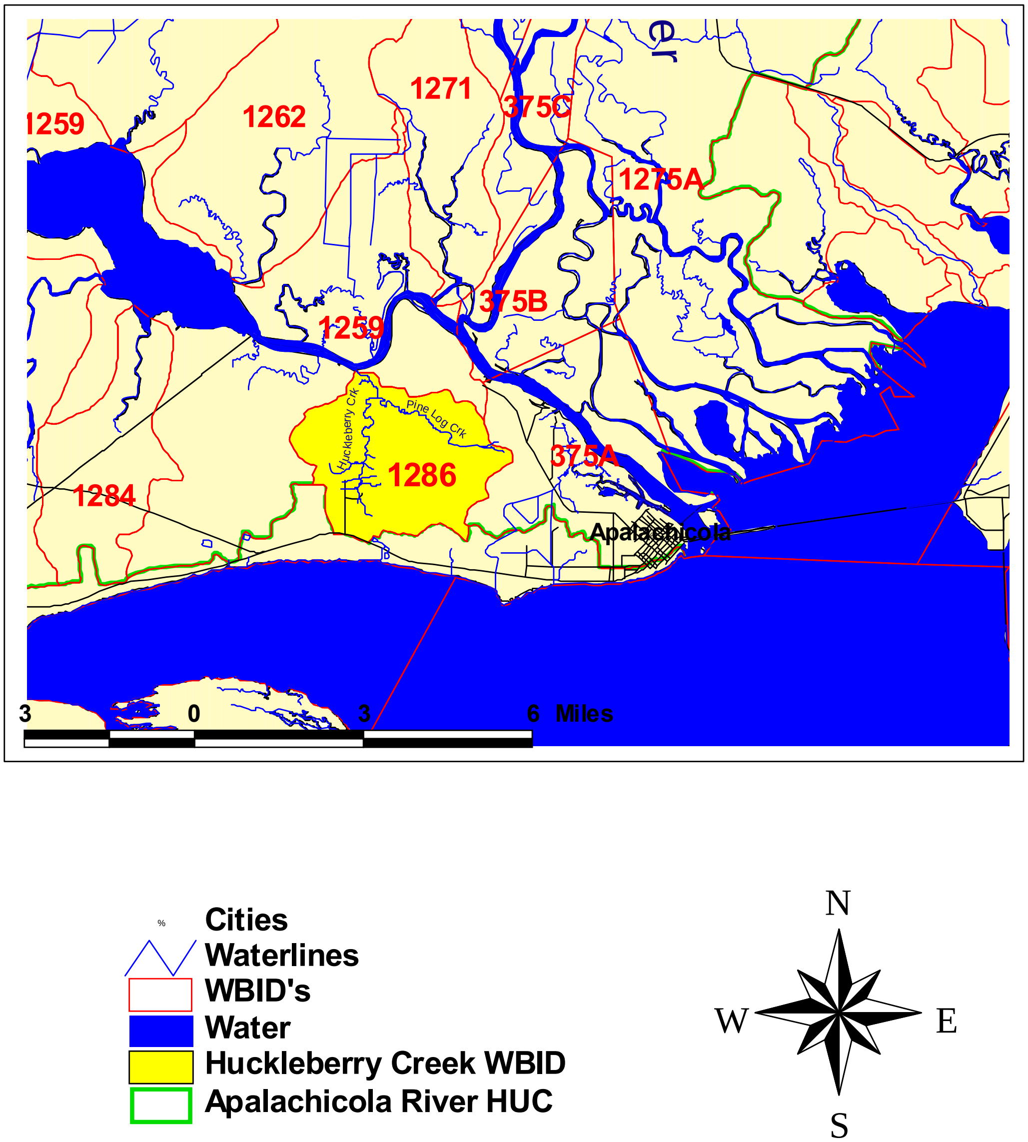


Figure 1.2. WBIDs in the Huckleberry Creek Basin

Huckleberry Creek



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. 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 coliform that caused the verified impairment of Huckleberry Creek. These activities will depend heavily on the active participation of the Northwest 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 in each of these 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 24 waterbodies in the Apalachicola-Chipola 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 Huckleberry Creek and has verified the impairments listed in **Table 2.1**. The fecal coliform impairment has been verified with recently obtained data. Impairments on the 1998 303(d) list also included total coliform, but it was delisted because of a flaw in the 1998 listing and mapping process. Nutrients, biology, and dissolved oxygen (DO) were also listed as parameters on the 1998 list, and DO was also verified as a parameter causing impairment, but a TMDL for DO is not scheduled for development until 2008. Low DO was linked to high biochemical oxygen demand (BOD5) in the creek based on data collected by the Department and a consultant (Whitfield, 2004). Evidence of biological impairment has been reported by the Department, but has not been verified (FDEP, 2003). There is also evidence from anecdotal information and photos (Ritchie, 2000) since 1995 of excess aquatic plant coverage in Huckleberry Creek. Some of these data are included in **Appendix F. Table 2.2** provides assessment results for fecal coliform for each waterbody segment during the verification period.

Table 2.1. Verified Impaired Segments in the Huckleberry Creek Basin

WBID	Parameters of Concern	Priority for TMDL Development	Projected Year for TMDL Development
1286	FECAL COLIFORM	HIGH	2003
1286	DISSOLVED OXYGEN	MEDIUM	2008

Note: The parameters listed in **Table 2.1** provide a complete picture of the impairment in the river, but this TMDL only addresses coliform impairment.

Table 2.2. Fecal Coliform Data

Station Number	Data Provider	Date	Station Description	Time (24 hr)	Fecal Coliform (N/100mL)	Fecal Strep (N/100mL)
3	BRA	12/30/99	Huckleberry Creek at Moses Rd	1115	**500**	
3	BRA	03/31/00	Huckleberry Creek at Moses Rd	1118	**2400**	
3	BRA	06/16/00	Huckleberry Creek at Moses Rd	1025	240	
3	BRA	09/08/00	Huckleberry Creek at Moses Rd	940	300	
3	BRA	12/30/00	Huckleberry Creek at Moses Rd	1408	240	
3	BRA	03/14/01	Huckleberry Creek at Moses Rd	1150	130	
3	BRA	06/08/01	Huckleberry Creek at Moses Rd	1049	**500**	
3	BRA	09/20/01	Huckleberry Creek at Moses Rd	1105	**900**	
3	BRA	12/13/01	Huckleberry Creek at Moses Rd	1130	**1600**	
3	BRA	03/14/02	Huckleberry Creek at Moses Rd	1133	300	
3	BRA	12/04/02	Huckleberry Creek at Moses Rd	1110	18	
3	BRA	06/04/03	Huckleberry Creek at Moses Rd	838	**5200**	
3	BRA	08/13/03	Huckleberry Creek at Moses Rd	848	6	
3	BRA	10/19/03	Huckleberry Creek at Moses Rd	810	20	
6	Larry Schwartz	01/31/82	Huckleberry Creek at Moses Rd		19	
6	Larry Schwartz	02/28/82	Huckleberry Creek at Moses Rd		120	
6	Larry Schwartz	03/31/82	Huckleberry Creek at Moses Rd		46	

Station Number	Data Provider	Date	Station Description	Time (24 hr)	Fecal Coliform (N/100mL)	Fecal Strep (N/100mL)
6	Larry Schwartz	04/30/82	Huckleberry Creek at Moses Rd		18e	
6	Larry Schwartz	05/31/82	Huckleberry Creek at Moses Rd		>244	
6	Larry Schwartz	06/30/82	Huckleberry Creek at Moses Rd		30e	
6	Larry Schwartz	07/31/82	Huckleberry Creek at Moses Rd		57	
6	Larry Schwartz	08/31/82	Huckleberry Creek at Moses Rd		36	
6	Larry Schwartz	10/31/82	Huckleberry Creek at Moses Rd		58	
6	Larry Schwartz	11/30/82	Huckleberry Creek at Moses Rd		345	
8807	FDEP	10/26/95	Huckleberry Creek at Moses Rd	1635	140	280
8807	FDEP	12/06/95	Huckleberry Creek at Moses Rd	1005	200	80
8807	FDEP	11/17/03	Huckleberry Creek at Moses Rd	1430	**1600**	120
8807	FDEP	12/15/03	Huckleberry Creek at Moses Rd	1030	160	830
8807	FDEP	03/23/04	Huckleberry Creek at Moses Rd	1020	20	90
8807	FDEP	03/23/04	Huckleberry Creek at Moses Rd	1022	15	86
8807	FDEP	03/31/04	Huckleberry Creek at Moses Rd	1245	30	172
8809.8	FDEP	06/17/03	Trib to Hucklberry Creek at Teat's Rd S. RR 0.25 Mi	1150	**430**	194
8809.9	FDEP	12/06/95	Trib to Huckleberry Creek at Teat's Rd UPS RR 10FT	1025	48	8
8809.9	FDEP	12/15/03	Trib to Huckleberry Creek at Teat's Rd UPS RR 10FT	1123	14	2
8809.9	FDEP	03/23/04	Trib to Huckleberry Creek at Teat's Rd UPS RR 10FT	1120	1	1
8809.9	FDEP	03/31/04	Trib to Huckleberry Creek at Teat's Rd UPS RR 10FT	1410	10	10
8810	FDEP	10/26/95	Huckleberry Creek at RR NR Teat's Rd.	1736	400	100
8810	FDEP	12/06/95	Huckleberry Creek at RR NR Teat's Rd.	1048	50	80
8810	FDEP	11/17/03	Huckleberry Creek at RR NR Teat's Rd.	1300	**520**	28
8810	FDEP	12/15/03	Huckleberry Creek at RR NR Teat's Rd.	1216	92	106
8810	FDEP	03/23/04	Huckleberry Creek at RR NR Teat's Rd.	1050	10	10
8810	FDEP	03/31/04	Huckleberry Creek at RR NR Teat's Rd.	1054	10	120
8820	FDEP	03/31/04	Huckleberry Creek DS Mouth of Trib 3 at Tilton Rd	1120	30	32
8825	FDEP	10/26/95	Huckleberry Creek at Teat's Dock	1154	**1000**	120

Station Number	**Data Provider**	**Date**	**Station Description**	**Time (24 hr)**	**Fecal Coliform (N/100mL)**	**Fecal Strep (N/100mL)**
8825	FDEP	12/06/95	Huckleberry Creek at Teat's Dock	845	90	40
8825	FDEP	11/17/03	Huckleberry Creek at Teat's Dock	1205	112	64
8825	FDEP	12/15/03	Huckleberry Creek at Teat's Dock	1231	112	150
8825	FDEP	03/23/04	Huckleberry Creek at Teat's Dock	1115	13	48
8825	FDEP	03/31/04	Huckleberry Creek at Teat's Dock	1202	1	64
8830	FDEP	10/26/95	Huckleberry Creek DS of Teat's Dock	1242	**500**	110
8830	FDEP	03/23/04	Huckleberry Creek DS of Teat's Dock	1136	15	20
8836	FDEP	03/31/04	Huckleberry Creek at Boat Landing	1300	20	20
8840	FDEP	10/26/95	Huckleberry Creek UPS Mouth of Pine Log Creek	1333	**550**	300
8840	FDEP	12/06/95	Huckleberry Creek UPS Mouth of Pine Log Creek	958	60	20
8840	FDEP	12/15/03	Huckleberry Creek	1256	82	64
8840	FDEP	03/23/04	Huckleberry Creek	1207	18	15
8840	FDEP	03/31/04	Huckleberry Creek	1320	23	24
8850	FDEP	10/26/95	Pine Log Creek ~ 200 Yrds up from Mouth	1355	270	300
8850	FDEP	11/17/03	Pine Log Creek ~ 200 Yrds up from Mouth	1219	100	86
8850	FDEP	12/15/03	Pine Log Creek ~ 200 Yrds up from Mouth	1326	108	52
8850	FDEP	03/23/04	Pine Log Creek ~ 200 Yrds up from Mouth	1222	12	8
8850	FDEP	03/31/04	Pine Log Creek ~ 200 Yrds up from Mouth	1337	12	5
8860	FDEP	10/26/95	Huckleberry Creek DS Mouth of Pine Log Creek	1408	290	280
8860	FDEP	03/31/04	Huckleberry Creek DS Mouth of Pine Log Creek	1355	7	10
8870	FDEP	10/26/95	Huckleberry Creek ~ 150 Yrds in from Mouth	1419	145	190
8870	FDEP	12/06/95	Huckleberry Creek ~ 150 Yrds in from Mouth	1025	90	40
8870	FDEP	11/17/03	Huckleberry Creek ~ 150 Yrds in from Mouth	1305	110	134
8870	FDEP	12/15/03	Huckleberry Creek ~ 150 Yrds in from Mouth	1346	210	138
8870	FDEP	03/23/04	Huckleberry Creek ~ 150 Yrds in from Mouth	1253	7	2
8870	FDEP	03/31/04	Huckleberry Creek ~ 150 Yrds in from Mouth	1416	5	5
D002	COA WWTP	06/30/00	Huckleberry Creek at Moses Rd		**500**	
D002	COA WWTP	09/30/00	Huckleberry Creek at Moses Rd		300	
D002	COA WWTP	12/31/00	Huckleberry Creek at Moses Rd		240	

Station Number	Data Provider	Date	Station Description	Time (24 hr)	Fecal Coliform (N/100mL)	Fecal Strep (N/100mL)
D002	COA WWTP	03/31/01	Huckleberry Creek at Moses Rd		**1600**	
D002	COA WWTP	06/30/01	Huckleberry Creek at Moses Rd		**500**	
D002	COA WWTP	09/30/01	Huckleberry Creek at Moses Rd		**980**	
D002	COA WWTP	01/31/02	Huckleberry Creek at Moses Rd		**>1600**	
D002	COA WWTP	03/31/02	Huckleberry Creek at Moses Rd		50	
D002	COA WWTP	06/30/02	Huckleberry Creek at Moses Rd		130	
D002	COA WWTP	12/31/02	Huckleberry Creek at Moses Rd		18	
D002	COA WWTP	06/30/03	Huckleberry Creek at Moses Rd		5.2	
D002	COA WWTP	08/31/03	Huckleberry Creek at Moses Rd		55	
D002	COA WWTP	10/31/03	Huckleberry Creek at Moses Rd		40	
D002	COA WWTP	03/31/04	Huckleberry Creek at Moses Rd		200	

Note: Biological Research Associates (BRA)
Florida Department of Environmental Protection (FDEP)
City of Apalachicola Waste Water Treatment Plant (COA WWTP)

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)**

Huckleberry Creek is a Class III waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. Huckleberry Creek Swamp is used as an experimental wetland for effluent disposal from the Apalachicola STP. The Class III water quality criterion applicable to the impairment addressed by this TMDL is fecal coliform.

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 fecal coliform criterion for the 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.*

The criterion states 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 curves for the impaired streams (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 fecal coliform bacteria. Therefore, the criterion selected for the TMDL was not to exceed 400 in 10 percent of the samples.

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 (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 Coliform in the Huckleberry Creek Watershed

4.2.1 Point Sources

There is only one permitted wastewater treatment facility that discharges pollutant loads to Huckleberry Creek **(Table 4.1).** The city of Apalachicola domestic WWTF is an activated sludge system that includes treatment consisting of a bar screen, aerated grit chamber, equalization basin, activated sludge (extended aeration) biological treatment for CBOD5 removal; secondary clarification; and disinfection by chlorine. Effluent is routed through a holding pond and then into Huckleberry Creek Swamp (a receiving wetland) **(Figure 4.1),** which then flows into Huckleberry Creek.

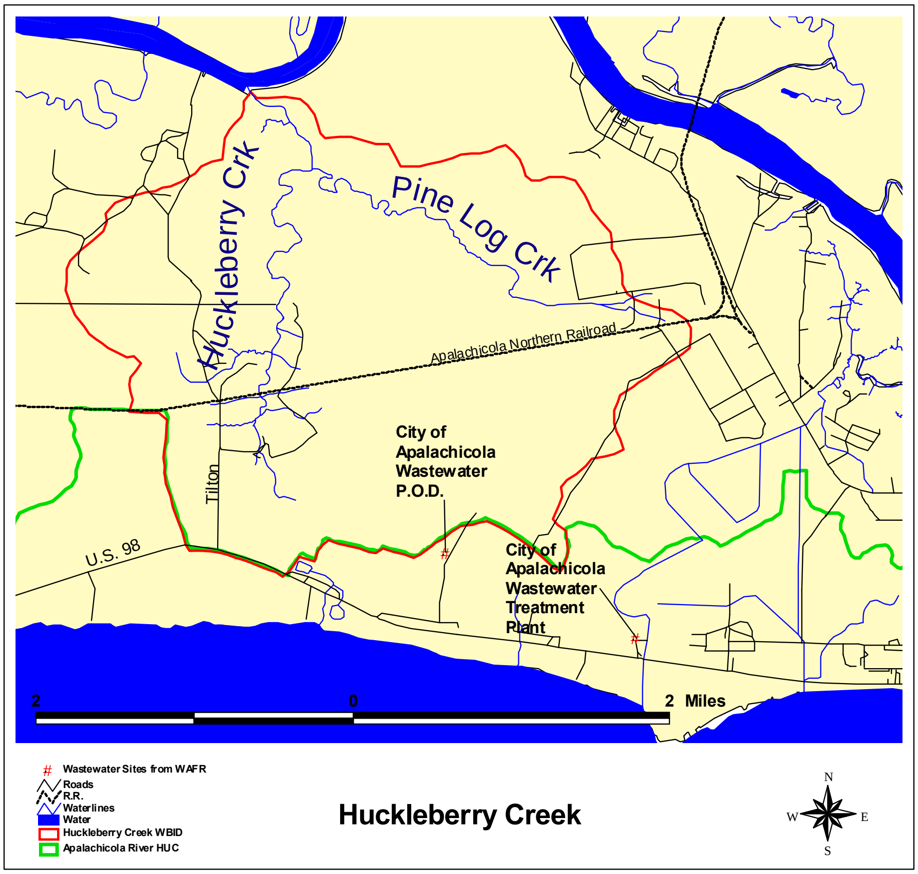
The facility has a design capacity of 1.0 million gallons per day (mgd). According to the Department's monitoring records, the average monthly flow for 2003 was 0.317 mgd. A summary of effluent coliform values is included as **Appendix E**. Reported data show numerous violations of the state Class III criterion for fecal coliforms at Outfall 002 (Moses Road). However, the permit was modified to include fecal coliform as a "Report Only" parameter (see note "Addmon" in **Appendix E**). **Appendix E** also provides flow data from the facility from Department records.

Industrial dischargers to the Apalachicola WWTF in the watershed include a few commercial facilities, boatyards, the Franklin County Prison, and an airport. A list of major dischargers in the Apalachicola–Chipola Basin is included in **Appendix C**.

Table 4.1. Point Sources in the Huckleberry Creek Watershed

WAFR Facility	Facility ID	Site ID	Name	Facility Status	Description	Feature
10067	FL0038857	EFD-552	City of Apalachicola	A	Y	Effluent Sampling point (D001)
10067	FL0038857	WIM-24214	City of Apalachicola	A	Y	1 - Huckleberry Swamp at POD from Force
10099	FLA010099	EFF-1	Apalachicola Northern Railroad	A	Effluent; After activated carbon filter	
10099	FLA010099	G-001	Apalachicola Northern Railroad	A	Percolation pond	Facility

Figure 4.1. Wastewater Facilities in the Huckleberry Creek Watershed



Municipal Separate Storm Sewer System Permittees

There are no Phase I or Phase II Municipal Separate Storm Sewer Systems (MS4s) in the Apalachicola–Chipola Basin. The stormwater collection systems owned and operated by the city of Apalachicola are not currently covered by an MS4 permit.

4.2.2 Land Uses and Nonpoint Sources

Additional fecal coliform loadings to Huckleberry Creek are generated from nonpoint sources in the watershed. Potential nonpoint sources of coliforms include loadings from surface runoff, wildlife, livestock, pets, the Apalachicola Northern Railroad (which bisects the basin), leaking septic tanks, marinas, and houseboats and other watercraft.

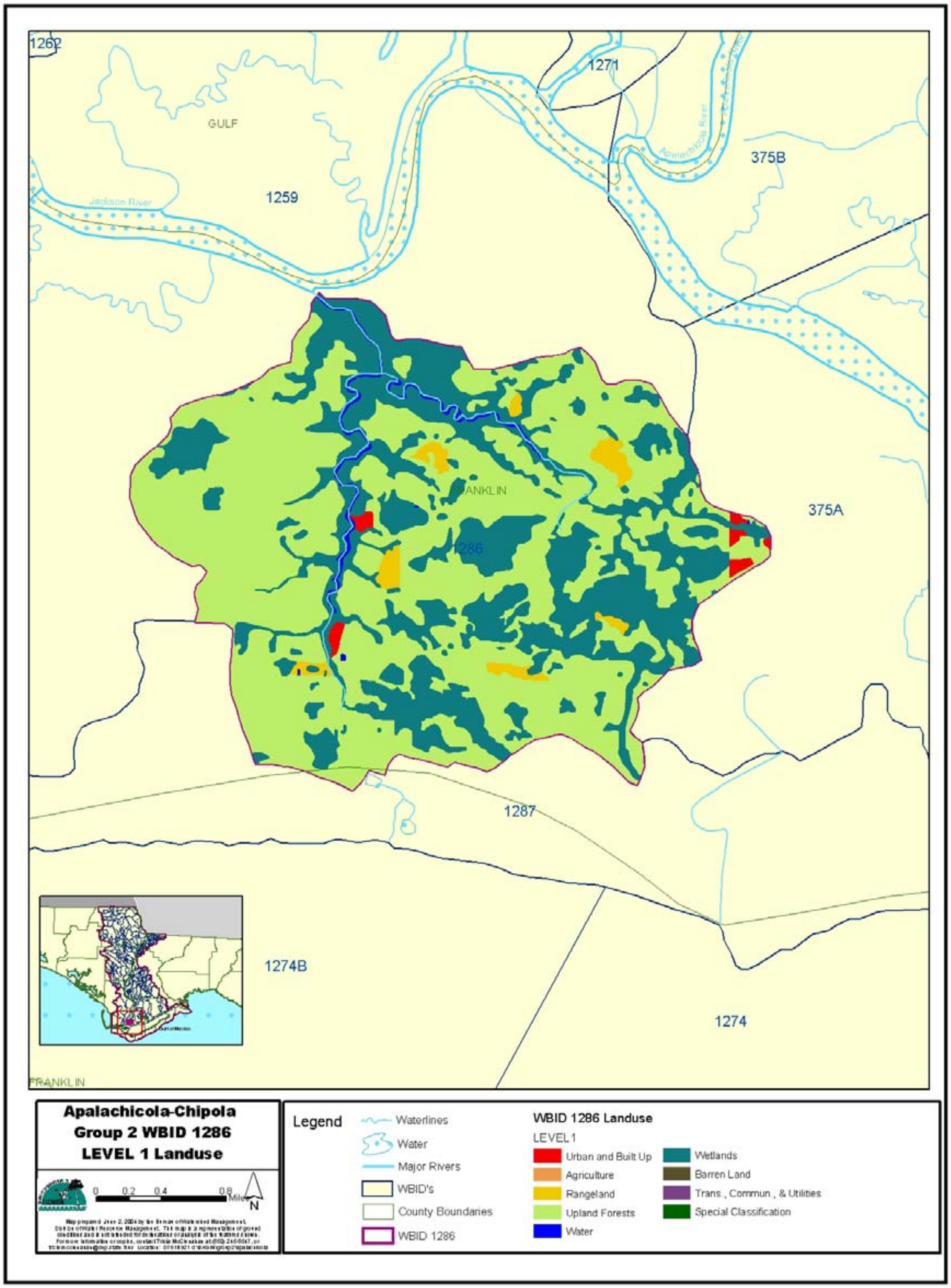
Land Uses

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 geographic information system (GIS) library. Land use categories in the watershed were aggregated using the simplified Level 1 codes tabulated in **Table 4.2. Figure 4.2** shows the acreage of the principal land uses in the watershed. Most of the land is upland forest and wetlands, with a very small amount in the urban and built-up category. A detailed summary of various land use loads by category is included in **Appendix B**.

Table 4.2. Classification of Land Use Categories in the Huckleberry Creek Watershed, WBID 1286 at Mouth

Code	Land Use	Acreage	Square Miles
1000	Urban and Built-Up	31.7549	0.0496
2000	Agriculture	0	0
3000	Rangeland	97.6857	0.1526
4000	Upland Forests	3060.2670	4.7817
5000	Water	46.6192	0.0728
6000	Wetlands	1694.7191	2.648
7000	Barren Land	0	0
8000	Transportation, Communications	0	0
Total		4931.0459	7.7047

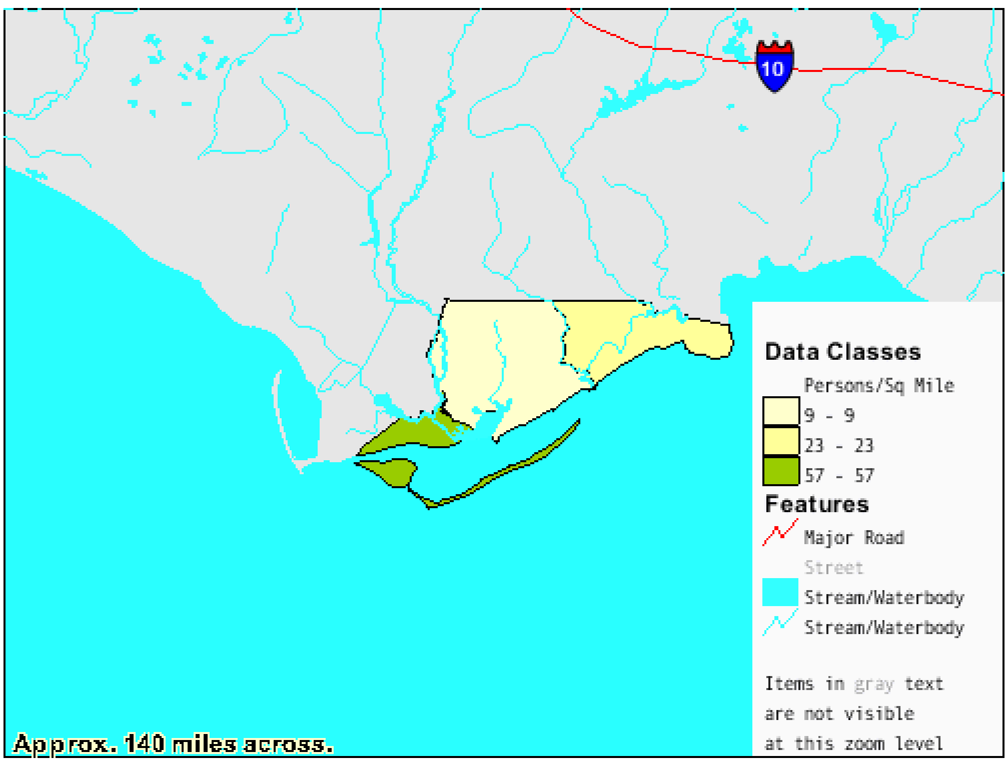
Figure 4.2. Principal Land Uses in the Huckleberry Creek Watershed



Population

According to the U.S Census Bureau (2004), the population density in and around WBID 1286 in 2000 was at or less than 10 people per square mile (10 persons/square mile is the minimum used by the Census Bureau) **(Figure 4.3).** The Bureau reports that the total population in Franklin County, which includes (but is not exclusive to) WBID 1286, was 11,057 with 7,180 housing units. For all of Franklin County, the Bureau reported a housing density of 13.2 houses per square mile. This places Franklin County among the lowest in housing densities in Florida (U.S. Census Bureau Web site, 2004). This is also supported by the land use, where only 0.647 percent of the land use in WBID 1286 is dedicated to residences (Level 1 Urban and Built Up category).

Figure 4.3. Population Density in Franklin County, Florida



Septic Tanks

Approximately 43 percent of the residences in the county are connected to the wastewater treatment plant, with the rest utilizing septic tanks (U.S. Census 1990). As of 2001, the Florida Department of Health (FDOH) reported that there were 4,475 permitted septic tanks in Franklin County (Florida Department of Health Web site, 2004). From fiscal years 1991 – 2002, 483 permits for repairs were issued, with no permits issued for repair in fiscal year 1993 (Florida Department of Health Web site, 2004).

WBID 1286 comprises 7.7047 square miles, or approximately 1.42 percent of the land area of Franklin County (544 square miles). The number of residences in WBID 1286 is not known, but the U.S. Census Bureau reports fewer than 10 persons/square mile in the WBID. To estimate the number of septic tanks in WBID 1286, we used the ratio of square miles of Level 1 land use category "Urban and Built Up" in the WBID to the square miles of Level 1 "Urban Built Up" for Franklin County, as shown in **Appendix B**. This translates to about 27 septic tanks for the entire WBID 1286. However, the number of septic tanks estimated upstream for the primary monitoring station 8807 at Moses Road is 3 septic tanks.

Between 1991 and 2002, an average of 48.3 permits per year was issued in the county for septic tank repairs. This number is about 1.08 percent of the total at any time. Previous studies (WMM model reference) have shown that failed septic tanks are not discovered for about 5 years. This means that the true failure rate at any time is approximately five times the repair rate of 1.08 percent, or 5.397 percent. As a margin of safety (MOS), the Department assumed the failure rate was twice that, or 10 percent of the total septic tanks within each WBID. Using these numbers (Florida Department of Health Web site, 2004) and 70 gallons/day/person (U.S. Environmental Protection Agency, 2001), a loading of 1.86E10 colonies/day was estimated for failed septic tanks in the entire WBID 1286 watershed.

Table 4.3. Estimation of Coliform Loading from Failed Septic Tanks in the Huckleberry Creek Watershed

Estimated Population Density and Area	Estimated Number of Septic Tanks in Area	Estimated Number of Tank Failures	Estimated Concentration From Failed Tank (cfu/100mL)	Gallons/ Person/ Day	Estimated Number of People Per Household	Estimated Load From Failing Tanks (cfu/day)
Based on estimate of 70 people in the 0.0496-square-mile area of urban/built-up land in Huckleberry Creek, WBID 1286	27	2.7	1.0E6	70	2.6	1.86E10

Livestock and Wildlife

Animal fecal matter, whether from livestock or wildlife, can be a significant source of coliform loadings to streams, depending on the number of animals, their location relative to the stream, and the best management practices (BMPs) used at individual agricultural operations. **Table 4.4** summarizes the estimated average daily fecal coliform loadings from 1990 through 2002, based on the numbers of livestock, wildlife, and domestic pets in the Huckleberry Creek watershed (**Appendix B** contains a more detailed listing). It should be noted that the loadings shown in **Table 4.4** are total loadings to the land in the creek watershed, and this total load would not be expected to reach the creek (due to decay processes on land).

4.4 External Loadings to Huckleberry Creek from Downstream Waters Due to Tidal Action

External loadings to Huckleberry Creek from the Jackson River (WBID 1259) due to tidal flow were also estimated (see **Appendix D**). Because the lower three miles of Huckleberry Creek is tidally affected by the Jackson River (Intracoastal Waterway), measured values could not be directly used to calculate loads for this portion of the river, and an estimate was made of this loading using the tidal prism approach (Thomann, 1987; Mills, 1985; and Pritchard, 1969). During a given day, there are either two high and two low tides (semidiurnal) or one high and one low tide (diurnal). If we assume a two-layer flow for the tidal portion of Huckleberry Creek, then for about 12 hours per day, flow from the Jackson River enters the lower layer of Huckleberry Creek, while the creek flow continues downstream. A rough estimate of this lower layer flow is the tidal prism or wedge volume divided by the 12-hour time of flooding. **Appendix D** shows an estimate of the tidal prism and flow at the mouth of Huckleberry Creek. The average of the seasonal median fecal coliform concentrations (87.19 cfu/100 ml) for WBID 1259 and tidal flow calculated above (18.33 cfs) were used to estimate the fecal coliform load of 3.911E10 cfu/day.

Table 4.4. Average Daily Quantity of Internal Fecal Coliform Loading into Huckleberry Creek –see Appendix B for complete table.*

Nonpoint Source Category	WBID 1286, Huckleberry Creek at Moses Road	WBID 1286, Huckleberry Creek at Mouth	WBID 1286, Huckleberry Creek at Mouth	Franklin County
	Fecal Coliform Load (CFU/day)	Fecal Coliform Load (CFU/day)	Fecal Coliform Percent of Total Load in WBID 1286	Fecal Coliform Load (CFU/day)
Livestock	0	0	0	0
Wildlife	7.029E11	6.0175E12	95.5	3.9209E14
Domestic Animals	3.1006E10	2.6543E11	4.21	4.4667E13
Septic	2.8799E9	1.8320E10	0.29	4.1487E12
TOTAL	**7.3681E11**	**6.3013E12**	**100.00**	**4.4091E14**

* Table is summary of all nonpoint source categories in Appendix B.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

The methodology (Davis, 2004) used for this TMDL is the "load duration curve." Also known as the "Kansas Approach" because it was developed by the state of Kansas (Stiles, 2003), this method has been well documented in the literature (Cleland, 2002, 2003), with improved modifications used by EPA Region 4 (Davis, 2004). The method relates the pollutant concentration to the flow of the stream to establish the existing loading capacity and the allowable pollutant load (TMDL) under a spectrum of flow conditions, and then determines the maximum allowable pollutant load and load reduction requirement based on the analysis of the critical flow condition. 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. Identify the five zones of flow on the duration curves (high, 0-10; moist, 10-40; mid-range, 40-60; dry, 60-90; low, 90-100) and define the critical condition(s), and
4. Establish the needed load reduction by comparing the existing loading with the allowable load under critical conditions (in this case, the 40^{th} to 90^{th} percentile flows were used).

5.1.1 Data Used in the Determination of the TMDL

There are 3 sampling stations in WBID 1286 that have historical coliform observations for Huckleberry Creek **(Figure 5.1).** The primary data collector of historical data was Biological Research Associates (Whitfield, 2004; Young 2001), acting as a consultant for the City of Apalachicola WWTF, which maintained routine sampling sites at the outfall to the wetland, mid-wetland, and in Huckleberry Creek at Moses Road. These sites were sampled on a quarterly basis from December 30, 1999, through October 19, 2003. **Table 5.1** provides a brief statistical overview of the observed data at these sites. **Figure 5.2** shows the observed historical data over time, and **Appendix G** contains the historical observations from the sites.

In addition to the historical data, the Department conducted numerous intensive surveys in 1995, 2003, and 2004. The Department installed a Campbell recording water level/flow gage on Huckleberry Creek at Moses Road (FDEP Station 8807) on March 17, 2004. **Table 5.2** and **Appendix H** provide brief statistical overviews of these recent survey data. **Figure 5.3** shows the location of sites sampled during these surveys, and **Figure 5.4** shows a graphical display of the observations from these surveys. Graphs in **Appendix G** show fecal coliform in Huckleberry Creek plotted versus river mile (x=0.0 miles is at Moses Road). During the October 26, 1995, survey, 4 of 7 samples were at or above 400 cts/100mL throughout the stream. On June 17, 2003, 2 of 3 samples were above 400 cts/100mL, but only a limited portion of the stream was sampled. On November 17, 2003, 2 of 4 samples (in the upper portion of the creek) were above 400 cts/100mL. The surveys of December 15, 2003, March 23, 2004, and March

31, 2004 did not have any exceedances. In general, the creek distribution of fecal values is slightly higher near the headwaters.

Table 5.1. Statistical Table of Observed Historical Data for Huckleberry Creek, WBID 1286

WBID	Total Number of Samples	Geometric Mean of F.Col. (N/100ml)	No. of Samples >400 N/100ml	Minimum Concentration (N/100ml)	Maximum Concentration (N/100ml)
1286	42	109	13	1	5200

Figure 5.1. Historical Monitoring Sites in Huckleberry Creek, WBID 1286

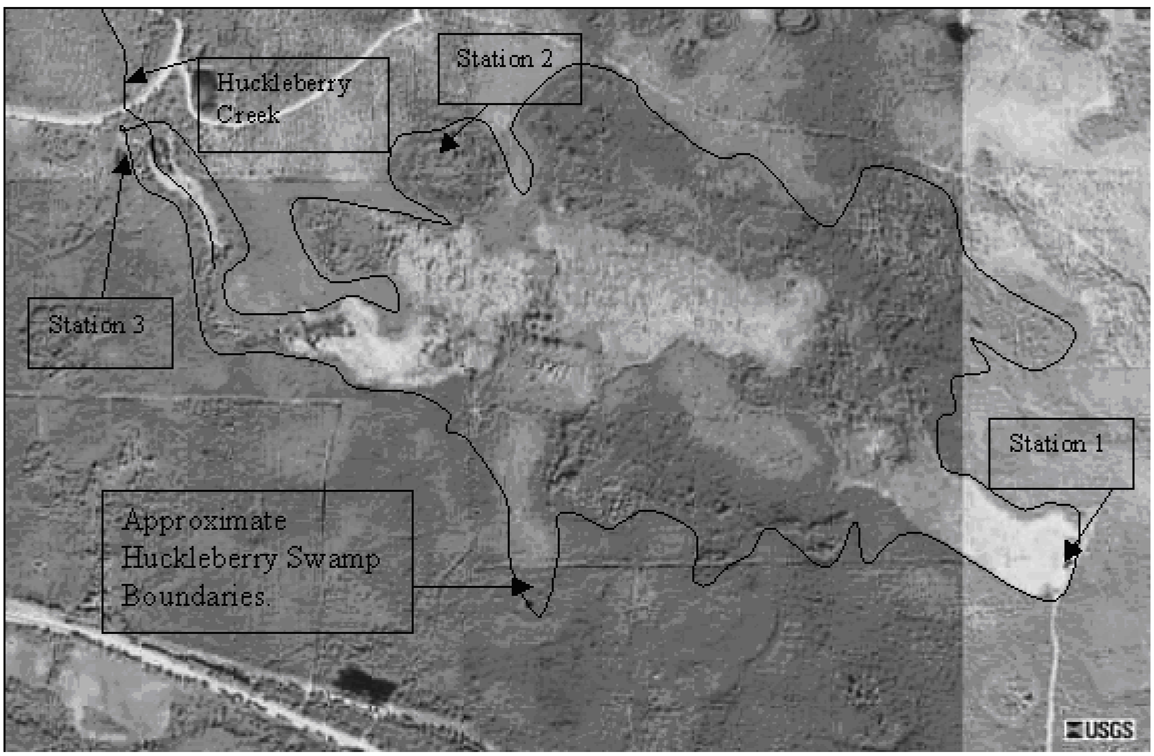


Figure 5.2. Chart of Historical Observations for Huckleberry Creek

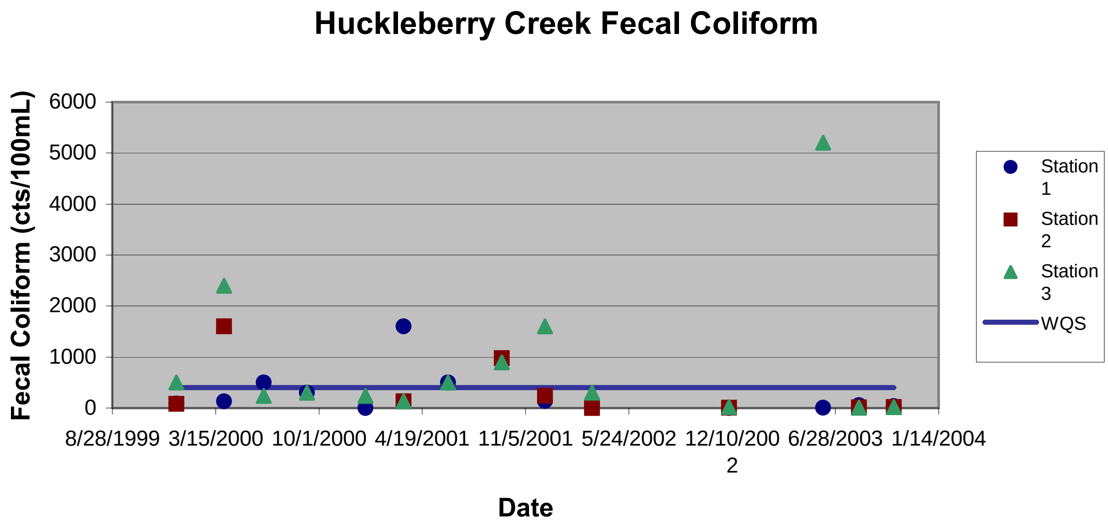


Figure 5.3. Department's Intensive Monitoring Sites in Huckleberry Creek

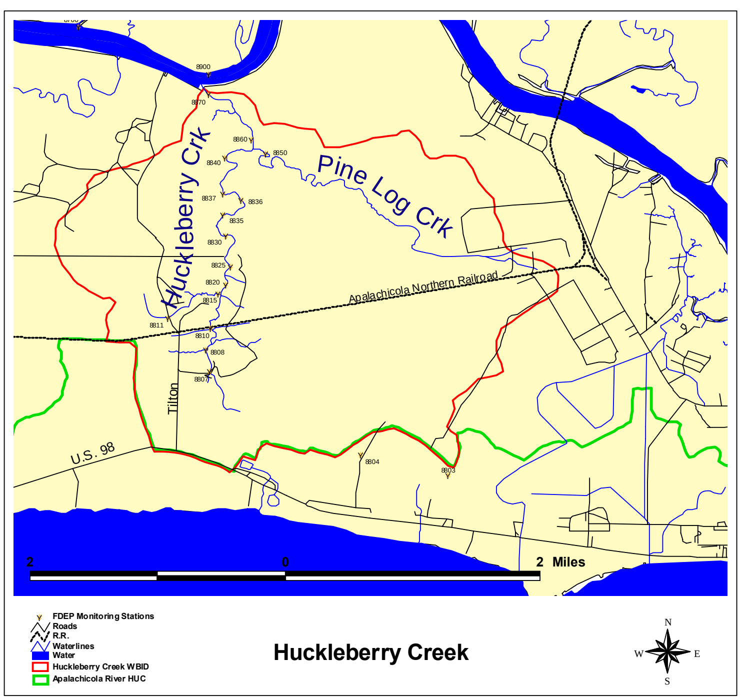


Figure 5.4. Recent Fecal Coliform Data for Huckleberry Creek, WBID 1286

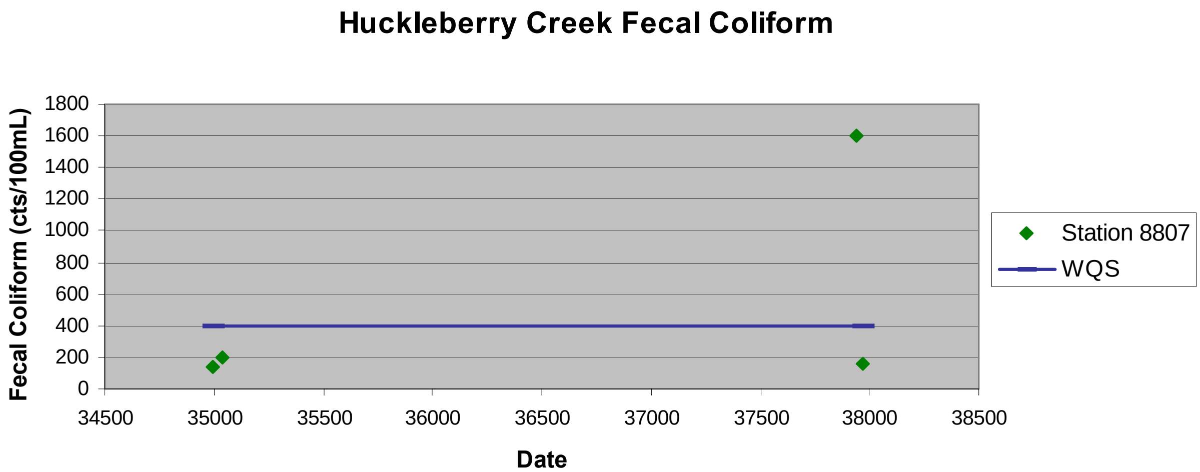


Table 5.2. Statistical Table of Observed Recent Data from the Department's Intensive Surveys for Huckleberry Creek

WBID	Total Number of Samples	Geometric Mean of Fecal Coliforms (N/100ml)	Number of Samples >400 N/100ml	Minimum Concentration (N/100ml)	Maximum Concentration (N/100ml)
1286	17	265	7	6	5200

5.1.2 TMDL Development Process

A flow duration curve was developed for Huckleberry Creek at Moses Road (FDEP Station 8807) based on flow records from USGS gages at Telogia Creek at S.R. 20 (USGS 02330100), located near Bristol, and at Huckleberry Creek at Moses Road (USGS 02359224) (see **Appendix H**) **(Figure 5.5).** The record from Telogia Creek was used because the USGS gage at Moses Road was only operational during a brief period from 1984 to 1988. Regression analysis between the flows from each gage over this period showed that this site correlated with an R^2 value of 0.2836. Since the Department's gage was only operational since late March 2004, the drainage area ratio approach between Huckleberry Creek and Telogia Creek was used to estimate the flow for Huckleberry at Moses Road and then develop a flow duration curve for Huckleberry Creek.

Using the flows from this curve, a load duration curve for fecal coliform **(Figure 5.6)** was calculated using the following equation:

(observed flow cfs) x (conversion factor 2.45E07) x (state criterion 400 cfu) = (cfu/day or daily load)   (1)

The above equation yields the load duration curve or allowable load curve **(Figure 5.6).** The fecal coliform load (CFU/day) was calculated using Equation 1 (above) by substituting the state criterion with the measured value. Fecal coliform observations were then plotted, noting where the samples were in relation to the allowable load curve (above or below the curve). Those above the curve **(Figure 5.6)** are noted as exceedances to the state criterion and are indicated by red triangles.

Figure 5.5. Flow Duration Curve for USGS Gage 02359224

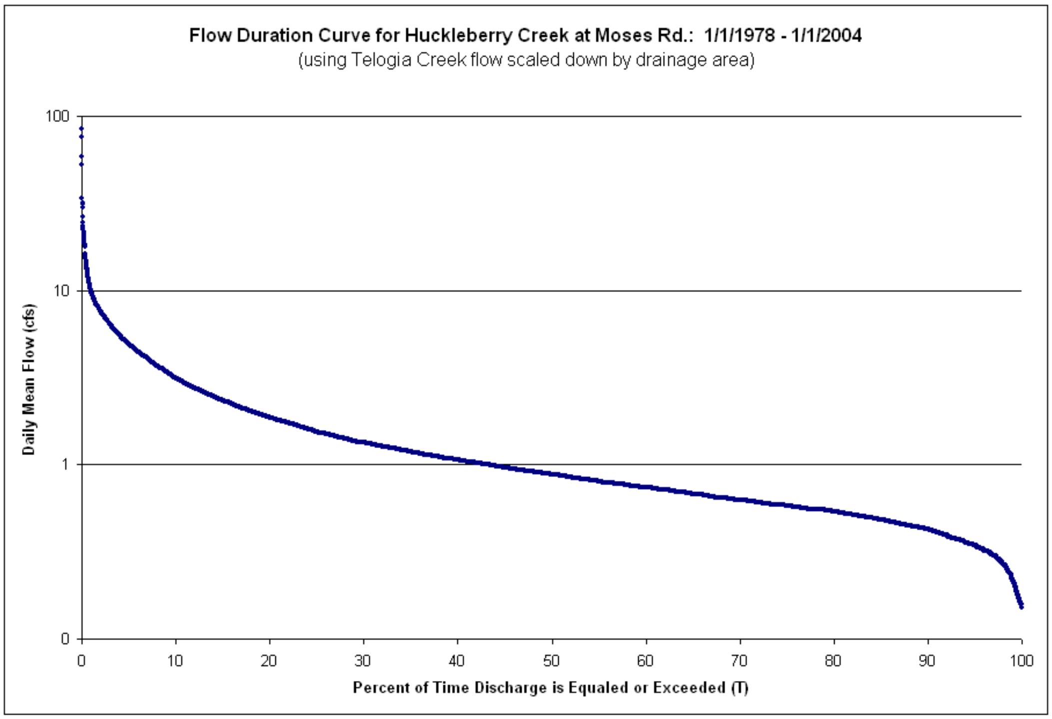


Figure 5.6. Total Fecal Coliform Observations and Load Duration Curve with Line-of-Best-Fit (Exponential Curve)

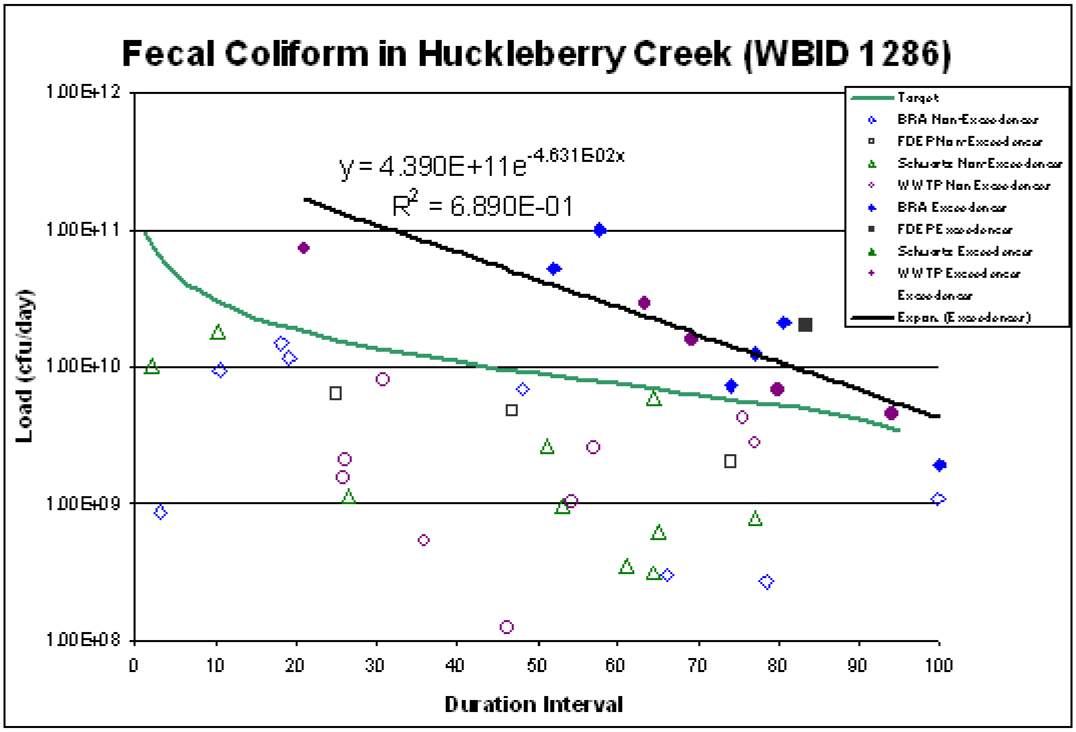
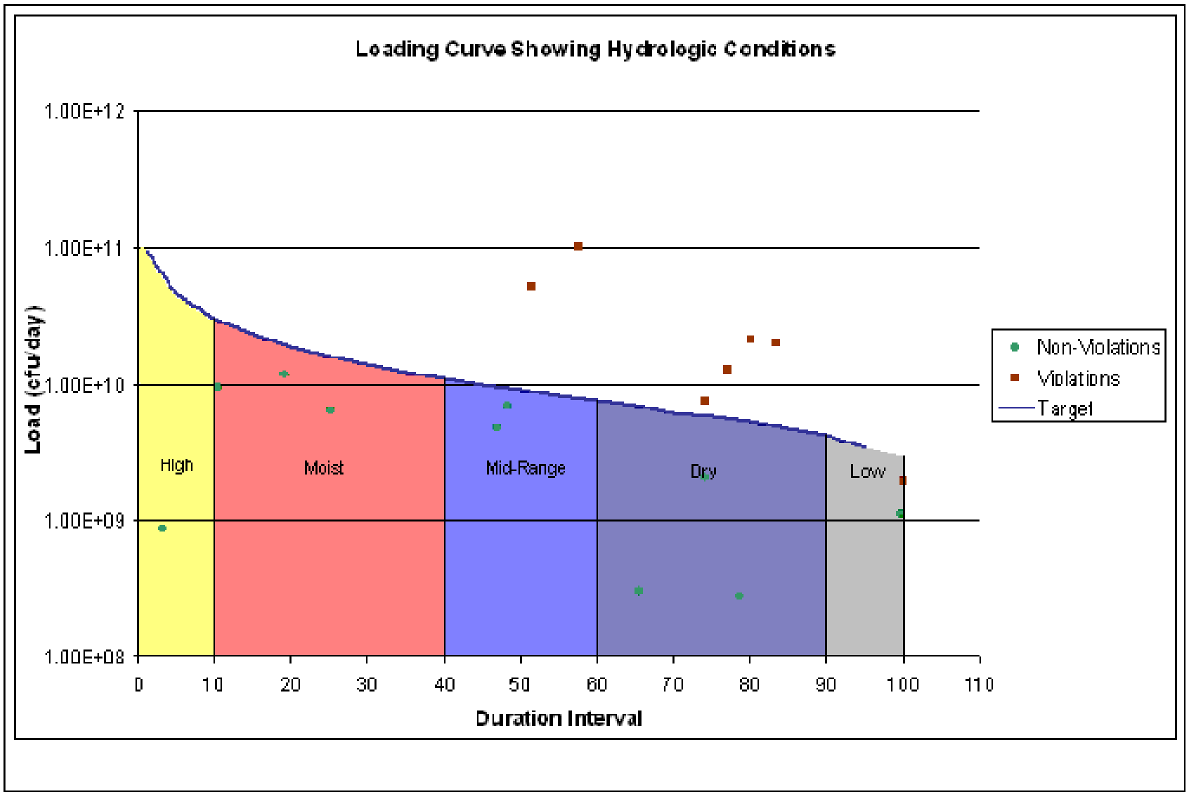


Table 5.3. Observed Data for Calculating Exceedances to the State Criterion for Huckleberry Creek, WBID 1286

Fecal Coliform Station	Sample Date	Sample Time	Flow (cfs) using Telogia flow scaled by Drainage Area	Flow Rank (%)	Fecal Coliform (cfu/100mL)	Fecal Coliform Load (CFU/day)
6	01/31/82		0.75	61.1%	19	3.49E+08
6	02/28/82		0.9	51.1%	120	2.64E+09
6	03/31/82		0.8643	53.0%	46	9.73E+08
6	04/30/82		0.7071	64.5%	18	3.11E+08
6	05/31/82		3.0143	10.3%	244	1.80E+10
6	06/30/82		1.55	26.6%	30	1.14E+09
6	07/31/82		7.2857	2.0%	57	1.02E+10
6	08/31/82		0.6929	65.1%	36	6.10E+08
6	10/31/82		0.5643	77.1%	58	8.01E+08
6	11/30/82		0.7071	64.5%	345	5.97E+09
8807	10/26/95	1635	0.600	74.1%	140	2.06E+09
8807	12/06/95	1005	0.971	47.0%	200	4.75E+09
3	12/30/99	1115	0.600	74.1%	500	7.34E+09
3	03/31/00	1118	0.886	52.1%	2400	5.20E+10
3	06/16/00	1025	0.1857	99.8%	240	1.09E+09
D002	06/30/00		0.3643	94.0%	500	4.46E+09
3	09/08/00	940	0.9429	48.2%	300	6.92E+09
D002	09/30/00		0.5786	75.6%	300	4.25E+09
3	12/30/00	1408	1.9714	19.1%	240	1.16E+10
D002	12/31/00		1.3643	31.0%	240	8.01E+09
3	03/14/01	1150	2.9857	10.5%	130	9.50E+09
D002	03/31/01		1.8423	21.1%	1600	7.21E+10
3	06/08/01	1049	0.1571	100.0%	500	1.92E+09
D002	06/30/01		0.5423	80.1%	500	6.63E+09
3	09/20/01	1105	0.5714	77.1%	900	1.26E+10
D002	09/30/01		0.65	69.2%	980	1.56E+10
3	12/13/01	1130	0.5357	80.6%	1600	2.10E+10
D002	01/31/02		0.7214	63.3%	1600	2.82E+10
3	03/14/02	1133	2.0357	18.2%	300	1.49E+10
D002	03/31/02		0.85	54.4%	50	1.04E+09
D002	06/30/02		0.8	57.1%	130	2.54E+09
3	12/04/02	1110	0.6857	66.1%	18	3.02E+08
D002	12/31/02		1.2143	36.0%	18	5.35E+08
3	06/04/03	838	0.7929	57.6%	5200	1.01E+11
D002	06/30/03		0.9786	46.3%	5.2	1.25E+08
3	08/13/03	848	5.8929	3.2%	6	8.65E+08
D002	08/31/03		1.5643	26.2%	55	2.10E+09
3	10/19/03	810	0.5571	78.6%	20	2.73E+08
D002	10/31/03		1.5786	25.9%	40	1.54E+09
8807	11/17/03		0.5071	83.4%	1600	1.99E+10
8807	12/15/03		1.6143	25.1%	160	6.32E+09
D002	03/31/04		0.5643	77.1%	200	2.76E+09

Values on the load duration curve can generally be grouped by hydrologic conditions to identify the most likely potential sources. Exceedances falling into the 11th through 40th percentile flows are typically associated with moist conditions when stormwater loads are the most likely source, and exceedances falling in the 61st through 90th percentiles are typically associated with dry conditions when point sources are likely the dominant source **(Figure 5.7** and **Table 5.4).** The plotted data show that most of the exceedances occur under mid-range to dry conditions.

Figure 5.7. Loading Curve Showing Hydrologic Conditions



To determine the loading capacity, a trend-line of best-fit was applied through the exceedances **(Figure 5.6**). The best-fitting trend line was determined by evaluating different functions until the highest R^2 value was found. In this case, an exponential function was determined to be the best fit, and took the following form:

(2) Y= (4.390 E+11)*(EXP(-4.631E-02*X)), where

Y= Fecal Coliform Load (cfu/day) and x= % duration interval

This exponential function (Equation 2) was then used to predict the existing loads by substituting different percentile numbers (10th to 90th, incremented by 5, see **Table 5.4,** Column 1) for x. The result yields a range of predicted loads within each 5th percentile of the flow record (**Table 5.4**, Column 3). The percent reduction in loading needed for compliance with the state criterion for a given 5th percentile of the flow record was then calculated for each estimated load. This calculation involved both the allowable load and predicted loads previously computed (**Table 5.4**, Columns 2 and 3, respectively). Using percentile increments of 5 over the flow range with exceedances (ranging from 40 – 90, see **Table 5.4**), the needed reduction of daily load was computed using the following equation:

$$\frac{\text{(predicted load)} - \text{(allowable load)}}{\text{(predicted load)}} \times 100 \qquad (3)$$

The percent reduction in loading needed for compliance with the state criterion was then calculated as the median percent reduction over the range of flows where exceedances occurred (40th to 90th), which is 68.33 percent. Similarly, the loading capacity was established as the median allowable load over the range of flows where exceedances occurred, which is 6.850E + 09 CFU/day.

5.2.3 Critical Conditions/Seasonality

To ensure that this TMDL adequately addresses exceedances during all flow conditions, the TMDL was based on the reduction needed for the critical conditions. Based on the load duration curve, the critical conditions for Huckleberry Creek are the mid-range to dry range flows, which is the range of flows when the exceedances occurred. Over these flow conditions, a 68.33 percent reduction in coliform levels is needed to reach the coliform criterion.

Table 5.4. Table for Calculating Needed Reduction and Loading Capacity

Percent of Days Load Exceeded	Allowable Load (#colonies/day)	Predicted Load (#colonies/day)	Load Reduction Needed for Compliance
40	1.090E+10	6.885E+10	84.16
45	9.856E+09	5.462E+10	81.95
50	8.948E+09	4.333E+10	79.35
55	8.178E+09	3.437E+10	76.21
60	7.480E+09	2.727E+10	72.57
65	6.850E+09	2.163E+10	68.33
70	6.221E+09	1.716E+10	63.75
75	5.732E+09	1.361E+10	57.89
80	4.753E+09	1.080E+10	55.98
85	4.194E+09	8.567E+09	51.04
90	3.425E+09	6.796E+09	49.60
Median:	**6.850E+09**	**2.163E+10**	**68.33**

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:

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

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**. TMDLs for Huckleberry Creek are expressed in terms of CFU/day, percent reduction and concentration, and represent the maximum daily fecal load the river can assimilate and maintain the fecal coliform criterion **(Table 6.1).** It should be noted that the LA is the same as the TMDL (6.859E + 09 CFU/day) because the WLA (the load expected from the WWTF) was not subtracted from the loading capacity. The WLA was not subtracted from the loading capacity because the flow duration curve, based on which the loading capacity and LA were determined, did not include the flow from the WWTF. As described in Chapter 5, flows for Huckleberry Creek were estimated using drainage area ratios, which did not take WWTF flow into account.

Table 6.1. TMDL Components for Huckleberry Creek

WBID	Parameter	TMDL (colonies/day)	WLA		LA (colonies/day)	Percent Reduction	MOS
			Wastewater (count/100 mL)	NPDES Stormwater			
1286 at Moses Road	Fecal Coliform	6.850E +09	Meet Permit Concentration Limits	NA	6.850E +09	68.33	Implicit

6.2 Load Allocation (LA)

Based on a loading duration curve approach similar to that developed by Kansas (Stiles, 2003), a fecal coliform reduction of 68.33 percent is 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 (WLA

6.3.1 NPDES Wastewater Discharges

The City of Apalachicola WWTF is required to meet all water quality as a condition of their permit, including all three components of the fecal coliform criterion. This facility, and any future discharge permits issued within the Huckleberry Creek watershed, will be required to meet the state Class III criterion for fecal coliform, and therefore will not be allowed to exceed 200 counts/100 mLas a monthly average, 400 more than 10 percent of the time, or 800 counts/100 mL at any given time.

6.3.2 NPDES Stormwater Discharges

Not applicable.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Florida Department of Environmental Protection, February 2001), an implicit margin of safety (MOS) was used in the development of this TMDL. An implicit MOS was provided in the TMDL by not allowing any exceedances of the state criterion, even though intermittent natural exceedances of the criterion would be expected and would be taken into account when determining impairment. The TMDL also provides an implicit MOS because it does not take decay/die-off into account, and the coliform load from the WWTP is expected to decrease as it moves downstream in Huckleberry Creek. **Table 6.2** illustrates how the concentraion (and load) of the

Apalachicola STP effluent is expected to be reduced by decay as it moves toward the mouth of Huckleberry Creek.

It should be noted that the measured exceedances in Huckleberry Creek may have been due, at least in part, to discharges from the Apalachicola WWTF. However, the required reductions in nonpoint source fecal coliform loading did not take this into account because there was insufficient information about the timing of observed downstream exceedances and effluent violations. As such, the LA may be overly stringent.

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 city of Apalachicola is conducting a Water Quality–Based Effluent Limitation (WQBEL) study as part of its renewal application for the WWTP, and this study, along with monitoring that will be conducted by the Department, will provide valuable information about coliform levels in the watershed. The Department recognizes that it may be appropriate to revise the TMDL in the future when this additional information has been collected and analyzed.

Table 6.2. Estimated Decay Rates of Coliforms for Permitted Dischargers in the Watershed

Facility	Distance to WBID 1286 at Moses Road (miles)	Distance to WBID 1286 at Mouth (miles)	Estimated Travel Time through Segment (days)1	Coefficient2 (1/days)	Initial Concentration of Coliforms3 (cts/100mL)	Coliform Concentration at WBID 1286 Boundary (cts/100mL)	Percent Reduction from Decay
Apalachicola STP	0	3.38	2.065	1.0	400	50.70	87.33%

[1] Estimated velocity in tidal zone V =0.1 fps * 16.3634= 1.636 mi/day.
T=D/V = 3.38/1.636 = 2.064 days
Exp (-KT) = 0.1267
A
[2] Coefficients used are from the EPA document "Protocol for Developing Pathogen TMDLs" and Chapra, 1997.
[3] Maximum daily value. The monthly average value is 200 cts/100mL.

[3] Based on the state criterion geometric mean of 1,000 counts/100ml.

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 Apalachicola–Chipola Basin. 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.

It should be noted that the measured exceedances in Huckleberry Creek may have been due, at least in part, to discharges from the Apalachicola WWTF. However, the required reductions in nonpoint source fecal coliform loading did not take this into account because there was insufficient information about the timing of observed downstream exceedances and effluent violations. As such, the LA may be overly stringent.

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 city of Apalachicola is conducting a Water Quality–Based Effluent Limitation (WQBEL) study as part of its renewal application for the WWTP, and this study, along with monitoring that will be conducted by the Department, will provide valuable information about coliform levels in the watershed. The Department recognizes that it may be appropriate to revise the TMDL in the future when this additional information has been collected and analyzed.

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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.

Appendix B: Summary of Land Use Loads by Category

Land use Level 1 categories were used as a basis for calculating expected source loads of fecal and total coliform. Human census data from 1990 and 2000 were used for population information, sewage and septic tank percentages and number of households. Septic tank census data were obtained from the Florida Department of Health (FDOH) Web site. Additional information on geographic septic tank distribution was obtained from Department and FDOH reports. In general, septic tank and repair lists are only available by county by year for the past 30 years. The cumulative number of tanks has not been adjusted by the number abandoned, disconnected, or dismantled. Only 1 year of data is available for this information. GIS data linking septic tanks with latitude-longitude are not yet available for each county. These data were used in a TMDL study of Lake Lafayette. The author is pursuing the link of septic tank permits (by street address) to lat-long coordinates to distribute tanks by WBIDs and other basin delineations.

Animal census data were calculated from the American Veterinary Association Web site. Livestock Census Data were obtained from the U.S. Department of Agriculture Web site.

Wildlife census data were obtained from reports by the Florida Fresh Water Fish and Wildlife Commission and Florida Department of Agriculture and Consumer Services, and from previous TMDL studies conducted by the EPA and Georgia EPD.

TABLE 4.4														
HUCKLEBERRY CRK WBID 1286														
AVERAGE DAILY LOADING OF FECAL COLIFORM FROM														
LAND USE LEVEL1			FRANKLIN COUNTY		REFER-	WBID	1286		WBID	1286		FRANKLIN COUNTY		
			TOTAL		ENCES	AT MOSES RD			AT MOUTH			TOTAL		
			SQMI	%		SQMI	%		SQMI	%		SQMI	%	
1000	URBAN AND BUILT UP		8.3467	1.66824		5.7939E-03	0.643764664		4.9600E-02	0.643762898		8.3467E+00	1.6409E+00	
2000	AGRICULTURE		0.4219	0.084324		0.0000E+00	0		0.0000E+00	0		4.2190E-01	8.2941E-02	
3000	RANGELAND		7.5731	1.513622		1.7825E-02	1.980549394		1.5260E-01	1.980609239		7.5731E+00	1.4888E+00	
4000	UPLAND FORESTS		312.7106	62.50091		5.5856E-01	62.06202914		4.7817E+00	62.06211793		3.1271E+02	6.1475E+01	
5000	WATER		12.0183	2.402076		8.5039E-03	0.944874838		7.2800E-02	0.944877802		1.2018E+01	2.3627E+00	
6000	WETLANDS		165.3181	33.04183		3.0932E-01	34.36878196		2.6480E+00	34.36863213		1.6532E+02	3.2500E+01	
7000	BARREN LAND		0.7525	0.150401		0.0000E+00	0		0.0000E+00	0		7.5250E-01	1.4793E-01	
8000	TRANSPORTATION AND UTILITIES		1.5352	0.306838		0.0000E+00	0		0.0000E+00	0		1.5352E+00	3.0180E-01	
	TOTAL LAND		497	99.26616		8.9150E-01	99.05512516		7.6319E+00	99.0551222		4.9666E+02	9.7637E+01	
	TOTAL LAND+WATER		500	100		9.0000E-01	100		7.7047E+00	100		5.0868E+02	1.0000E+02	
	TOTAL CENSUS 2000		544											
	URBAN RATIO WBID/COUNTY		1			6.9415E-04			5.9425E-03					
	TOTAL SEPTIC TANKS THRU 2000		4475			3.1063E+00			2.6593E+01			4.4750E+03		
	TOTAL REPAIRS THRU 2000		483			3.3528E-01			2.8702E+00			4.8300E+02		
	TOTAL FAILURES		447.5			3.1063E-01			2.6593E+00			4.4750E+02		
	TOTAL HOUSEHOLDS		7180			4.9840E+00			4.2667E+01			7.1800E+03		
	TOTAL HOUSEBOATS													
	TOTAL 1990 PUBLIC SEWER		2539									2539		
	TOTAL 1990 SEPTIC		3236									3236		
	TOTAL 1990 OTHER		116									116		
	TOTAL POPULATION		11057			7.6753E+00			4.5610E-02					
LIVESTOCK, WILDLIFE, AND DOMESTIC ANIMALS					REFER-	WBID	1286		WBID	1286		FRANKLIN COUNTY		
					ENCES							AT MOUTH		
ANIMAL TYPE	FC PRODUCED	ANIMALS	COUNTY	ANIMAL		DA1	NDA1	LFC1	DA2	NDA2	LFC2	DA3	NDA3	LFC3
	LFC	PER COUNTY	AREA	DENSITY										
	CTS/ANIMAL/DAY		SQMI	N/SQMI		SQMI	N	CTS/DAY	SQMI	N	CTS/DAY	SQMI	N	CTS/DAY
			544			9.0000E-01			7.7047E+00			5.0868E+02		
LIVESTOCK														
CATTLE AND CALVES INVENTORY														
CATTLE AND CALVES SOLD	1.04E+11													0.0000E+00
DAIRY CATTLE INVENTORY	1.01E+11		544		C									0.0000E+00
BEEF CATTLE INVENTORY	1.04E+11		544		C									0.0000E+00
SHEEP AND LAMBS INVENTORY	1.20E+10		544		C									0.0000E+00
SHEEP AND LAMBS SOLD	1.20E+10													0.0000E+00
HORSES AND PONIES INVENTORY	4.20E+08		544		C									0.0000E+00
HORSES AND PONIES SOLD	4.20E+08													0.0000E+00
MULES, BURROS, AND DONKEYS	4.20E+08		544		C,E									0.0000E+00
MULES, BURROS, AND DONKEYS	4.20E+08													0.0000E+00
LLAMAS (~SHEEP)	1.20E+10		544		C,E									0.0000E+00
BISON (~BEEF CATTLE)	1.04E+11		544		C,E									0.0000E+00
DEER	5.00E+08		544		C,E									0.0000E+00
ELK	5.00E+08		544		C,E									0.0000E+00
GOATS, ALL (~SHEEP) INVENTOR	1.20E+10		544		C,E									0.0000E+00
GOATS, ALL (~SHEEP) SOLD	1.20E+10													0.0000E+00
HOGS AND PIGS INVENTORY	1.08E+10		544		C									0.0000E+00
HOGS AND PIGS SOLD	1.08E+10													0.0000E+00
LAYER CHICKENS INVENTORY	1.40E+08		544		C									0.0000E+00
LAYER CHICKENS SOLD	1.40E+08													0.0000E+00
BROILERS INVENTORY	1.40E+08		544		C									0.0000E+00
BROILERS SOLD	1.40E+08													0.0000E+00
TURKEYS INVENTORY	9.50E+07		544		C									0.0000E+00
TURKEYS SOLD	9.50E+07													0.0000E+00
DUCKS INVENTORY	2.50E+09		544		C									0.0000E+00
DUCKS SOLD	2.50E+09													0.0000E+00
GEESE INVENTORY	4.90E+10		544		C									0.0000E+00
GEESE SOLD	4.90E+10													0.0000E+00
EMUS (~GEESE)	4.90E+10		544		C,E									0.0000E+00
OSTRICHES (~GEESE)	4.90E+10		544		C,E									0.0000E+00
PHEASANTS (~GEESE) INVENTOR	4.90E+10		544		C,E									0.0000E+00
PHEASANTS (~GEESE) SOLD	4.90E+10													0.0000E+00
PIGEONS OR SQUAB INVENTORY	1.60E+08		544		C									0.0000E+00
PIGEONS OR SQUAB SOLD	1.60E+08													0.0000E+00
QUAIL (~PIGEON)	1.60E+08		544		C									0.0000E+00
OTHER			544		C									0.0000E+00
RABBITS INVENTORY			544		C									0.0000E+00
RABBITS SOLD														0.0000E+00
TOTAL LIVESTOCK			544		C			0			0			0.0000E+00
			544		C									
WILDLIFE			544		C									
ALLIGATORS			544		C									0.0000E+00
BLACK BEARS			544		C									0.0000E+00
RACCOONS	1.25E+08		544		C									0.0000E+00
BEAVERS	2.50E+08		544		C									0.0000E+00
DEER	5.00E+08		544	22.16	CHI		1.9816E+01	9.9078E+09		1.6964E+02	8.4819E+10		1.1053E+04	5.5266E+12
DOLPHIN, PORPOISE,MANATEE			544		C									0.0000E+00
WATERFOWL	4.90E+10		544	12.4	CHI		1.1088E+01	5.4332E+11		9.4923E+01	4.6512E+12		6.1851E+03	3.0307E+14
WILD PIGS	1.08E+10		544	15.5	CHI		1.3860E+01	1.4969E+11		1.1865E+02	1.2815E+12		7.7313E+03	8.3498E+13
			544		C									0.0000E+00
TOTAL WILDLIFE			544		C			7.0292E+11			6.01752E+12			3.9209E+14
			544		C									
DOMESTIC ANIMALS			544		C									
DOGS	5.00E+09		544	0.58*HH	F		2.8907E+00	1.4454E+10		2.4747E+01	1.2373E+11		4.1644E+03	2.0822E+13
CATS	5.00E+09		544	0.66*HH	F		3.2895E+00	1.6447E+10		2.8160E+01	1.4080E+11		4.7388E+03	2.3694E+13
HORSES AND PONIES-PETS	4.20E+08		544	0.05*HH	F		2.4920E-01	1.0466E+08		2.1333E+00	8.9601E+08		3.5900E+02	1.5078E+11
TOTAL DOMESTIC			544					3.1006E+10			2.6543E+11			4.4667E+13
			544											
SEPTIC- HUMAN IMPACTS			544											
HUMAN	2.00E+09	11057	544											0.0000E+00
SEWER LINE LEAKS			544		J			7.3991E+08			6.3342E+09			1.0659E+12
HOUSEBOATS-NONMARINA	2.00E+09		544		C									0.0000E+00
BOATS-MARINA SLIPS	2.00E+09		544											0.0000E+00
SEPTIC TANKS FAILED	6.89E+09		544				3.1063E-01	2.1400E+09		2.6593E+00	1.8320E+10		4.4750E+02	3.0828E+12
SEPTIC TANKS NORMAL			544											0.0000E+00
SEPTIC TANKS -ATU	2.76E+08		544											0.0000E+00
TOTAL SEPTIC			544					2.8799E+09			1.8320E+10			4.1487E+12
AQUACULTURE														
FISH FARMS														0.0000E+00
OYSTER HOUSES														0.0000E+00
TOTAL AQUACULTURE														0.0000E+00
TOTAL								7.3681E+11			6.3013E+12			4.4091E+14
REFERENCES														
A	USDA 2002 CENSUS, NOTE A-D INDICATES CONFIDENTIAL DATA NOT AVAILABLE AT													
B	ASSUME 1 ANIMAL PER HOUSEHOLD* 7180 HOUSING UNITS=7180													
C	EPA, 2001. PROTOCOL FOR DEVELOPING PATHOGEN TMDLS EPA 841-R-00-002													
D	ASAE, 1998. HTTP://ASAE.ORG													
E	ESTIMATED FROM SIMILAR ANIMALS													
F	WWW.AVMA.ORG VETERINARY STATISTICS 2002 US PET OWNERSHIP- DOGS=0.58*HOUSEHOLDS, CATS=0.66*HH, HORSES=0.05*HH													
G	SPEAS, 2004 RANGE OF 500 CFU-1900 CFU/100 ML OR 96% REMOVAL, USE ONE ATU=0.04*6.89E09 CFU/DAY													
H	WWW.EPA.GOV/REGION1/ASSISTANCE/CEITTS/WASTEWATER/TECHS/DELTA.HTML													
I	SHIELDS, 2001. ANNUAL REEVALUATION OF APALACHICOLA BAY HARVESTING AREA #16													
J	EPA, 2001 ASSUME 5% LEAKAGE OF DESIGN FLOW IN SEWERED BASIN, CONC =1.0E6/100 ML													

Appendix C: Summary of Permitted Point Source Loads and Decay Rates

The major permitted point sources in the Florida portion of the Apalachicola–Chipola Basin have been summarized in a spreadsheet. The maximum design flow and location were tabulated for each facility from Department permit data and the Apalachicola–Chipola Basin Status Report. An assumed maximum daily permit limit of fecal coliform = 400 CFU/100ml was assigned to each facility even though some permits were designed around the 800 CFU/100 ml daily limit. The loads in CFU/day were then computed at the outfall locations.

River mile locations on the main river and tributaries were assigned based on U.S. Army Corps of Engineers published river miles (U.S. Army Corps of Engineers, 1985), previous Department reports (Wieckowicz, 1995, 2000), or derived from maps as needed. The total distance from each facility to the mouths of each tributary and the Apalachicola River was measured from maps.

The travel time from each facility to the mouth of the Apalachicola River was computed from the average velocity of the Apalachicola River for various flow conditions. A logarithmic velocity-flow correlation was established from historical U.S. Geological Survey (USGS) records (U.S. Geological Survey, 2004) as follows:

$V = \alpha\ Q^{\beta}$ where,
$Ln\ (V) = Ln\ \alpha + \beta\ (Ln\ (Q))$,
V = fps, and
Q= cfs.

This equation was used to calculate the velocity for the Q10th%tile (high flow), Q50th%tile, and Q90th%tile (low flow) at the USGS gage Apalachicola River at Blountstown (02358700). Where Q10th% is the flow that is exceeded 10 percent of the time.

The decay rate K_b or Kb (1/day) of fecal coliform is defined in several literature sources (Chapra, 1997; EPA, 2001) as:

$Kb = (0.8 + 0.02 * S) * (1.07 **(T-20)) + (\alpha*I0)/(Ke/H)*(1-exp(-Ke*H))+ Fp* (Vs/H)$, where
S = salinity (ppt),
T = temperature (°C),
α = constant,
I0 = surface light energy (ly/hr),
Ke = light extinction coefficient (1/m),
H = depth of water (m),
Fp = fraction of bacteria attached to suspended solids, and
Vs=solids settling velocity (m/day).

This shows that bacterial decay is a function of the salinity, temperature, light, depth, suspended solids, and settling rate. Given that seawater has a salinity S of 30-35 ppt, the base rate for freshwater decay of 0.8/day is increased to 1.4/day. Consequently, it can be seen that increased light and settling will increase water column decay rates. However, bacteria in sediments not exposed to light may remain for some time. Recent published reports (Fujioka, 2004) state that "Fecal indicator bacteria (fecal coliforms, E. coli, enterococci) can multiply and persist in soil, sediment, and water in some tropical/subtropical environments (Hawaii, Guam, Puerto Rico, south Florida)."

The loss function exp (-Kb* T) was then computed for each facility to compute the fecal load delivered to the mouth of the Apalachicola River, and then to Apalachicola Bay.

APALACHICOLA BAY STP FECAL COLIFORM DECAY						CONV						ALPHA1	CONV					CONVERSION
APALSTPDECAY.XLS						FACTOR						#####	FACTOR					FACTOR
TRAVEL TIME AND DECAY FOR INDIVIDUAL STPS IN THE BASIN						2.45E+07						BETA1	16.363					2.45E+07
												0.5						
STP	FACILITY	DISCHARGE	QDESIGN	QDESIGN	CFC	LOAD FC	XMTRIB1	XMTRIB2	XMRIVER	XMTOT	QRIVER	VRIVER	VRIVER	T	K	EXP(-K*T)	CFC	LOAD FC
	ID	TYPE			AT OUTFALL	AT OUTFALL			APALACH		2E+06				T=20 DEGC		AT MOUTH	AT MOUTH
																	APAL. RIVER	APAL.RIVER
			MGD	CFS	N/100ML	CFU/DAY	MI	MI	MI	MI	CFS	FPS	MI/DAY	DAYS	1/DAY		N/100ML	CFU/DAY
SNEADS (SPRAY IRRIGATION)	FLA010115	SPRAY	0.495	0.7659	400	7.4952E+09		1	107.6	109	50000	2.2361	36.59	2.9675	1	0.0514	2.0573E+01	3.8549E+08
FLORIDA STATE HOSPITAL	FL0031402	SURFACE	1.3	2.0114	400	1.9684E+10	1	4.76	106.3	112	50000	2.2361	36.59	3.0626	1	0.0468	1.8706E+01	9.2054E+08
CHATTAHOOCHEE	FL0027669	SURFACE	0.5	0.7736	400	7.5709E+09		2.31	106.3	109	50000	2.2361	36.59	2.9683	1	0.0514	2.0556E+01	3.8906E+08
GULF POWER-SCHOLZ ELECTRIC GENERATING PLANT	FL0002283	SURFACE	129.6	200.5210	400	1.9624E+12			103.9	104	50000	2.2361	36.59	2.8401	1	0.0584	2.3367E+01	1.1464E+11
BLOUNTSTOWN	FL0026867	SURFACE	1.5	2.3208	400	2.2713E+10		2.22	75	77.2	50000	2.2361	36.59	2.1104	1	0.1212	4.8474E+01	2.7524E+09
MARIANNA	FL0020117	SURFACE	2.7	4.1775	400	4.0883E+10		78.1	28.2	106	50000	2.2361	36.59	2.9052	1	0.0547	2.1895E+01	2.2379E+09
WEWAHITCHKA	FL0020125	SURFACE	0.2	0.3094	400	3.0283E+09		39.4	28.2	67.6	50000	2.2361	36.59	1.8475	1	0.1576	6.3051E+01	4.7735E+08
APALACHICOLA	FL0038857	SURFACE	1	1.5472	400	1.5142E+10	3.38	2.95	5.7	12	50000	2.2361	36.59	0.3288	1	0.7198	2.8792E+02	1.0899E+10
EASTPOINT (SPRAY IRRIGATION)	FLA010065	SPRAY	0.165	0.2553	400	2.4984E+09		1	0.5	1.5	50000	2.2361	36.59	0.041	1	0.9598	3.8393E+02	2.3980E+09
SNEADS (SPRAY IRRIGATION)	FLA010115	SPRAY	0.495	0.7659	400	7.4952E+09		1	107.6	109	15000	1.2247	20.041	5.4179	1	0.0044	1.7746E+00	3.3252E+07
FLORIDA STATE HOSPITAL	FL0031402	SURFACE	1.3	2.0114	400	1.9684E+10	1	4.76	106.3	112	15000	1.2247	20.041	5.5915	1	0.0037	1.4917E+00	7.3408E+07
CHATTAHOOCHEE	FL0027669	SURFACE	0.5	0.7736	400	7.5709E+09		2.31	106.3	109	15000	1.2247	20.041	5.4194	1	0.0044	1.7719E+00	3.3538E+07
GULF POWER-SCHOLZ ELECTRIC GENERATING PLANT	FL0002283	SURFACE	129.6	200.5210	400	1.9624E+12			103.9	104	15000	1.2247	20.041	5.1854	1	0.0056	2.2391E+00	1.0985E+10
BLOUNTSTOWN	FL0026867	SURFACE	1.5	2.3208	400	2.2713E+10		2.22	75	77.2	15000	1.2247	20.041	3.8531	1	0.0212	8.4855E+00	4.8182E+08
MARIANNA	FL0020117	SURFACE	2.7	4.1775	400	4.0883E+10		78.1	28.2	106	15000	1.2247	20.041	5.3041	1	0.005	1.9884E+00	2.0323E+08
WEWAHITCHKA	FL0020125	SURFACE	0.2	0.3094	400	3.0283E+09		39.4	28.2	67.6	15000	1.2247	20.041	3.3731	1	0.0343	1.3713E+01	1.0382E+08
APALACHICOLA	FL0038857	SURFACE	1	1.5472	400	1.5142E+10	3.38	2.95	5.7	12	15000	1.2247	20.041	0.6003	1	0.5487	2.1947E+02	8.3077E+09
EASTPOINT (SPRAY IRRIGATION)	FLA010065	SPRAY	0.165	0.2553	400	2.4984E+09		1	0.5	1.5	15000	1.2247	20.041	0.0748	1	0.9279	3.7115E+02	2.3182E+09
SNEADS (SPRAY IRRIGATION)	FLA010115	SPRAY	0.495	0.7659	400	7.4952E+09		1	107.6	109	8000	0.8944	14.636	7.4188	1	0.0006	2.3996E-01	4.4963E+06
FLORIDA STATE HOSPITAL	FL0031402	SURFACE	1.3	2.0114	400	1.9684E+10	1	4.76	106.3	112	8000	0.8944	14.636	7.6565	1	0.0005	1.8918E-01	9.3096E+06
CHATTAHOOCHEE	FL0027669	SURFACE	0.5	0.7736	400	7.5709E+09		2.31	106.3	109	8000	0.8944	14.636	7.4208	1	0.0006	2.3947E-01	4.5324E+06
GULF POWER-SCHOLZ ELECTRIC GENERATING PLANT	FL0002283	SURFACE	129.6	200.5210	400	1.9624E+12			103.9	104	8000	0.8944	14.636	7.1004	1	0.0008	3.2992E-01	1.6186E+09
BLOUNTSTOWN	FL0026867	SURFACE	1.5	2.3208	400	2.2713E+10		2.22	75	77.2	8000	0.8944	14.636	5.2761	1	0.0051	2.0450E+00	1.1612E+08
MARIANNA	FL0020117	SURFACE	2.7	4.1775	400	4.0883E+10		78.1	28.2	106	8000	0.8944	14.636	7.263	1	0.0007	2.8041E-01	2.8659E+07
WEWAHITCHKA	FL0020125	SURFACE	0.2	0.3094	400	3.0283E+09		39.4	28.2	67.6	8000	0.8944	14.636	4.6188	1	0.0099	3.9459E+00	2.9874E+07
APALACHICOLA	FL0038857	SURFACE	1	1.5472	400	1.5142E+10	3.38	2.95	5.7	12	8000	0.8944	14.636	0.822	1	0.4396	1.7583E+02	6.6559E+09
EASTPOINT (SPRAY IRRIGATION)	FLA010065	SPRAY	0.165	0.2553	400	2.4984E+09		1	0.5	1.5	8000	0.8944	14.636	0.1025	1	0.9026	3.6104E+02	2.2550E+09

Appendix D; Summary of Measured External Loads and Decay Rates

		EXTERNAL LOADS TO TIDAL RIVER											
FROM													
WBID	NAME	WBID	NAME										
		1286	HUCKLEBERRY CREEK										
		LENGTH	LENGTH	WIDTH	DEPTH	DEPTH	LONGITUD	TRANS	HORIZ	TIDAL	TIDAL	TIDAL	TIDAL
					HW	MOUTH	AREA	AREA	AREA	PERIOD	PERIOD	RANGE	FLOOD
		L	L	WIDTH	DHW	DM	DELTAVL	AVT	AH	TFL	TFL	DELTH	DELTH/2
		MI	FT	FT	FT	FT	FT**2	FT**2	FT**2	HRS	SEC	FT	FT
1259	JACKSON RIVER	3.0000E+00	1.5840E+04	1.0000E+02	1.0000E+00	5.0000E+00	7.9200E+03		1.5840E+06	1.2000E+01	4.3200E+04	2.0000E+00	1.0000E+00
		TIDAL	TIDAL	FECAL	DATA	N	YEARS	TOTAL	DATA	N	YEARS	FECAL	TOTAL
		PRISM	FLOW	COLIFORM	SOURCE			COLIFORM	SOURCE			COLIFORM	COLIFORM
		DELTV	QFL	CFCFL				CTCFL				CFCFL	CTCFL
		FT**3	CFS	CFU/100ML				CFU/100ML				CFU/DAY	CFU/DAY
1259	JACKSON RIVER	7.9200E+05	1.8333E+01	8.7190E+01	A	8.0000E+00	1992-1998	3.0583E+02	A	6.0000E+00	1992-1998	3.9108E+10	1.3718E+11
DATA SOURCE													
A	IWR RUN 16.2 MAY 04, 2004 MEAN OF SEASONAL MEANS												

Appendix E: Summary of Effluent Data, Apalachicola STP, FL 0038857

Effluent data from the FDEP database WAFR and paper files are summarized below.

Station	Date	WWTP Monthly Average Flow (mgd)	Telogia Creek Daily Mean Flow (cfs)	FC 30 Day Average (cts/100mL)	Associated Limit (cts/100mL)	FC Daily Max (cts/100mL)	Associated Limit (cts/100mL)
001-1	1/31/89	0.718	62	15.00	200	240	800
001-1	2/28/89	0.729	89	3.00	200	130	800
001-1	3/31/89	0.875	129	2.00	200	130	800
001-1	4/30/89	0.784	61	2.00	200		800
001-1	5/31/89	0.750	62	2.00	200	2	800
001-1	6/30/89	1.100	175	3.30	200	8	800
001-1	7/31/89	0.909	173	2.00	200	2	800
001-1	8/31/89	0.764	164	3.00	200	130	800
001-1	9/30/89	1.020	110	132.00	200	240	800
001-1	10/31/89	1.060	87	25.00	200	160	800
001-1	11/30/89	0.948	294	20.30	200	240	800
001-1	12/31/89	1.210	182	5.40	200	110	800
001-1	1/31/90	1.050	208	4.45	200	110	800
001-1	2/28/90	1.030	208	17.00	200	330	800
001-1	3/31/90	1.040	337			330	800
001-1	4/30/90	0.848	122			350	800
001-1	5/31/90	0.667	57			540	800
001-1	6/30/90	0.519	47			540	800
001-1	7/31/90	0.649	49			33	800
001-1	8/31/90	0.540	60			33	800
001-1	9/30/90	0.529	57			8	800
001-1	10/31/90	0.561	35			1600	800
001-1	11/30/90	0.593	66			2	800
001-1	12/31/90	0.538	54			170	800
001-1	1/31/91	1.184	2960			2400	800
001-1	2/28/91	1.165	160			2	800
001-1	3/31/91	1.398	548			1600	800
001-1	4/30/91	1.387	184			170	800
001-1	5/31/91	1.414	736			2400	800
001-1	6/30/91	1.030	290			23	800
001-1	7/31/91	1.470	277			8	800
001-1	8/31/91	1.290	180			8	800
001-1	9/30/91	1.060	92			2400	800
001-1	10/31/91	0.891	78			33	800
001-1	11/30/91	0.677	81			2400	800
001-1	12/31/91	0.575	93			2	800
001-1	1/31/92	0.740	564			<2	800

Station	Date	WWTP Monthly Average Flow (mgd)	Telogia Creek Daily Mean Flow (cfs)	FC 30 Day Average (cts/100mL)	Associated Limit (cts/100mL)	FC Daily Max (cts/100mL)	Associated Limit (cts/100mL)
001-1	2/29/92	1.200	213			220	800
001-1	3/31/92	0.979	155			79	800
001-1	4/30/92	0.834	81			79	800
001-1	5/31/92	0.586	117			2	800
001-1	6/30/92	0.636	167			2	800
001-1	7/31/92	0.571	118			2	800
001-1	8/31/92	0.834	214			<2	800
001-1	9/30/92	0.750	119			<2	800
001-1	10/31/92	1.080	89			<2	800
001-1	11/30/92	1.050	181			70	800
001-1	12/31/92	0.719	126			<2	800
001-1	1/31/93	0.992	252			<2	800
001-1	2/28/93	0.838	320			<2	800
001-1	3/31/93	0.980	482			>2	800
001-1	4/30/93	0.727	111			<2	800
001-1	5/31/93	0.547	74			<2	800
001-1	6/30/93	0.511	228			<2	800
001-1	7/31/93	0.554	56			<2	800
001-1	8/31/93	0.580	252			2	800
001-1	9/30/93	0.729	45			<2	800
001-1	10/31/93	0.591	130			<2	800
001-1	11/30/93	0.896	78			2	800
001-1	12/31/93	0.873	94			4	800
001-1	1/31/94	0.945	1050			8	800
001-1	2/28/94	1.030	115			<2	800
001-1	3/31/94	1.200	516			2	800
001-1	4/30/94	0.738	155			2	800
001-1	5/31/94	0.597	117			<2	800
001-1	6/30/94	0.953	181			2	800
001-1	7/31/94	1.360	265			<2	800
001-1	8/31/94	1.910	200			79	800
001-1	9/30/94	1.490	164			2400	800
001-1	10/31/94	1.600	335			920	800
001-1	11/30/94	0.709	559			130	800
001-1	12/31/94	0.561	188			920	800
001-1	1/31/95	0.659	147			2	800
001-1	2/28/95		128			2	800
001-1	3/31/95	0.639	364			<2	800
001-1	4/30/95	0.744	91			<2	800
001-1	5/31/95	0.730	66			79	800
001-1	6/30/95	0.928	78			>2400	800
001-1	7/31/95	0.621	111			<2.0	800
001-1	8/31/95	1.010	58			2	800

Station	Date	WWTP Monthly Average Flow (mgd)	Telogia Creek Daily Mean Flow (cfs)	FC 30 Day Average (cts/100mL)	Associated Limit (cts/100mL)	FC Daily Max (cts/100mL)	Associated Limit (cts/100mL)
001-1	9/30/95	0.576	51			<2	800
001-1	10/31/95	0.589	97			12	800
001-1	11/30/95	0.647	151			12	800
001-1	12/31/95	0.725	112			<2	800
001-1	1/31/96	0.673	125			<2	800
001-1	2/29/96	0.772	136			<2	800
001-1	3/31/96	0.933	770			<2	800
001-1	4/30/96	0.947	371			<2	800
001-1	5/31/96	0.664	145			2	800
001-1	6/30/96	0.502	53			<2	800
001-1	7/31/96	0.625	78			<2	800
001-1	8/31/96	0.919	154			<2	800
001-1	9/30/96	0.829	198			<2	800
001-1	10/31/96	1.500	96			<2.0	800
001-1	11/30/96	0.760	99			<2	800
001-1	12/31/96	0.823	124			<2	800
001-1	1/31/97	0.816	180			<2	800
001-1	2/28/97	0.952	280			<2	800
001-1	3/31/97	0.687	97			<2	800
001-1	4/30/97	0.626	1000			<2	800
001-1	5/31/97	0.564	129			2	800
001-1	6/30/97	0.496	163			2	800
001-1	7/31/97	0.587	103			<2	800
001-1	8/31/97	0.954	70			<2	800
001-1	9/30/97	0.572	104			<2	800
001-1	10/31/97	0.547	251			<2	800
001-1	11/30/97	0.800	567			<2	800
001-1	12/31/97	0.878	214			<2	800
001-1	1/31/98	1.380	170			<2	800
001-1	2/28/98	1.670	748			<2	800
001-1	3/31/98	1.59	170				
001-1	4/30/98	0.714	107			<2	800
001-1	5/31/98	0.505	97			<2	800
001-1	6/30/98	0.462	51			<2	800
001-1	7/31/98	0.466	138			<2	800
001-1	8/31/98	0.499	56			<2	800
001-1	9/30/98	1.900	3710			4	800
001-1	10/31/98	0.968	106			2	800
001-1	11/30/98	0.546	101				800
001-1	12/31/98	0.472	123				800
001-1	1/31/99	0.573	123			0	800
001-1	2/28/99	0.638	102				800
001-1	3/31/99	0.636	77			<2	800

Station	Date	WWTP Monthly Average Flow (mgd)	Telogia Creek Daily Mean Flow (cfs)	FC 30 Day Average (cts/100mL)	Associated Limit (cts/100mL)	FC Daily Max (cts/100mL)	Associated Limit (cts/100mL)
001-1	4/30/99	0.514	53			<2	800
001-1	5/31/99	0.558	74			<2	800
001-1	6/30/99	0.558	188			<2	800
001-1	7/31/99	0.473	76				
001-1	8/31/99	0.558	62				
001-1	9/30/99	0.567	80				
001-1	10/31/99	0.715	61				
001-1	11/30/99	0.604	73				
001-1	1/31/00	0.558	101				
001-1	2/29/00	0.535	167				
001-1	3/31/00	0.557	124				
001-1	4/30/00	0.511	90				
001-1	5/31/00	0.418	24				
001-1	6/30/00	0.711	51				
001-1	7/31/00	0.759	50				
001-1	8/31/00	0.716	28				
001-1	9/30/00	2.080	81				
001-1	10/31/00	0.927	48				
001-1	11/30/00	0.781	92				
001-1	12/31/00	0.755	191				
001-1	1/31/01	0.689	76				
001-1	2/28/01	0.561	47				
001-1	3/31/01	1.193	258				
001-1	4/30/01	0.770	40				
001-1	5/31/01	0.497	25				
001-1	6/30/01	0.711	76				
001-1	7/31/01	1.020	402				
001-1	8/31/01	1.570	84				
001-1	9/30/01	0.784	91				
001-1	10/31/01	0.514	69				
001-1	11/30/01	0.333	85				
001-1	12/31/01	0.387	65				
001-1	1/31/02	0.272	101				
001-1	2/28/02	0.576	82				
001-1	3/31/02	0.696	119				
001-1	4/30/02	0.457	82				
001-1	5/31/02	0.330	66				
001-1	6/30/02	0.481	112				
001-1	7/31/02	0.501	130				
001-1	8/31/02	0.459	52				
001-1	9/30/02	0.357	134				
001-1	10/31/02	0.322	299				
001-1	11/30/02	0.292	102				

Station	Date	WWTP Monthly Average Flow (mgd)	Telogia Creek Daily Mean Flow (cfs)	FC 30 Day Average (cts/100mL)	Associated Limit (cts/100mL)	FC Daily Max (cts/100mL)	Associated Limit (cts/100mL)
001-1	12/31/02	0.281	170				
001-1	1/31/03	0.272	105				
001-1	2/28/03	0.306	1450				
001-1	3/31/03	0.369	249				
001-1	4/30/03	0.271	109				
001-1	5/31/03	0.259	81				
001-1	6/30/03	0.378	137				
001-1	7/31/03	0.372	397				
001-1	8/31/03	0.323	219				
001-1	9/30/03	0.342	77				
001-1	10/31/03	0.315					
001-1	11/30/03	0.304					
001-1	12/31/03	0.292					
001-1	1/31/04	0.276					
001-1	2/29/04	0.317					
001-1	3/31/04	0.271					
001-1	4/30/04	0.261					
	above 800 cts/100mL						

Appendix F: Summary of Photos and News Articles

Digital photos of the Huckleberry Creek watershed are presented below.

DEMOCRAT
Florida's Capital Newspaper

NO POLLUTION SOLUTION

In a 1998 photo, Eric Test pulls weeds that choke Huckleberry Creek near his home.

Apalachicola dumps sewage into waterway

By Bruce Ritchie
DEMOCRAT STAFF WRITER
APALACHICOLA

Eric and Wanda Test fulfilled a dream when they moved to Huckleberry Creek.

He was born on the creek and swam and fished its sand-bottom waters before moving away as a child. When he and his wife returned in 1975 and bought land there, the creek looked the same as he remembered it.

But now, the Tests won't set foot in the creek or eat its fish. It has turned dark and foul, and some of the fish they've caught have sores.

Apalachicola's sewage plant, described by a state inspector as "one of the worst" of the 75 she visits, has malfunctioned since it was built in 1985. The pollution has turned what one biologist called a "pristine" pine bog into a cattail marsh.

And a local judge has ruled that the plant, operated by a city that bills itself the "oyster capital of the world," has fouled the creek in front of the Tests' home.

The Tests blame not only Apalachicola, but also the state for allowing the pollution to continue for so long. State and federal agencies for more than a decade sent warning letters and proposed fines before agreeing with the city on plant improvements that were never made. The city is getting ready to build a new plant at the site of the existing plant on U.S. Highway 98, about three miles west of town. But it would continue to discharge to the outfall marsh that flows into Huckleberry Creek, a situation the Tests oppose.

Meanwhile, a local environmental group, Apalachicola Bay and River Keeper Inc., has notified the city it may sue over plant violations. Voters last year elected a new mayor who has appointed an environmental advisory committee to resolve the lingering dispute over the plant.

"The litigation is an

Please see SEWAGE, 4A

BRUCE RITCHIE | Democrat

Wanda and Eric Teat, who bought land on a "pristine" Huckleberry Creek in 1975, blame Apalachicola and the state for allowing the pollution to continue for so long.

Environmental Protection Agency proposed fining the city $73,872 for exceeding pollution limits. And the state prohibited the city from hooking up more homes and businesses without substantial improvements to the piping system.

When seeking federal and state grants to build a new plant and collection system, state and city officials described the sewage plant as regularly discharging "essentially untreated wastewater, laden with solids. ... This loading is destroying the wetlands and will pollute Apalachicola Bay."

In 1994, the Legislature approved $3.8 million for a new plant. The money was placed in an escrow account to earn interest.

That was about the same time the Teats started noticing changes in the creek, but they didn't connect the problems to the plant — at least not at first.

They noticed there were more plants in the creek in front of their home. Dollarweed and floating plants grew on the surface away from the shore, replacing the lily pads that were rooted on the bottom.

There were also fewer children at popular swimming holes on Huckleberry Creek.

In the summer of 1995, the trees on the western edge of the forested swamp started dying. The swamp usually was a dry pine forest and was once popular for hunting, Eric Teat said. But the forest became wet most of the time. There was constant standing water covered with green slime at the base of trees.

That's when the Teats learned the sewage treatment plant, 2.5 miles upstream, was broken and had been cited for state and federal violations.

The Teats file, win lawsuit

Hurricane Opal in October 1995 made matters worse. The storm swelled the creek with water, unleashing mats of floating plants that blocked the creek in front of the Teats' home. Thousands of fish were killed and the normally clear water turned a chocolate brown, the Teats say. The water also started smelling like raw sewage.

The once sandy bottom of the creek was covered with muck, and a gooey black substance was left on the yard and the dock when waters receded.

The Teats filed a lawsuit in 1995 charging that the city's sewage treatment plant had hurt their property value and deprived them use of their property and the creek.

Meanwhile, the creek worsened. There were more fish kills, the Teats said, and they caught fish with bleeding sores. A state biologist, however, could not find fish with sores.

In a 1998 trial, the Teats presented testimony from the ecologist Bacchus and state officials on the condition of the creek and the treatment plant. Inspector Candice Burgos testified that she inspects about 73 treatment plants a year and that Apalachicola's is "one of the worst."

And DEP biologist Joy Van Dyke said that the proliferation of nuisance plants, such as water hyacinth, was worse further upstream in the creek closer to the plant.

But the city presented testimony from a water-quality expert that said the creek in front of the Teats' house met government requirements for fishing and swimming.

Another witness for the city blamed beavers for the problems, testifying that their dams caused flooding at the discharge site.

Circuit Judge F. E. Steinmeyer III in September 1998 ruled largely in favor of the Teats. He agreed the plant was "doomed from the start" and that the city's operation of it "has consistently been negligent throughout its existence."

The upstream wetland was inundated by the plant discharge, reducing its filtering ability and putting nutrients in the creek that caused weed growth, he wrote.

Steinmeyer ruled in February that the couple is entitled to compensation. The city is appealing.

Robert Howell, the former Apalachicola mayor, denied the city refused to help the Teats.

"There was no way I could satisfy the Teats," he said. "They wanted me to push a button and make it all disappear. The president of the United States could not do any more than I could do."

Likewise, Greg Smith, an official in DEP's Pensacola office, said there was nothing more the state could do.

In 1998, six years after proposing the $73,872 fine against the city, an EPA official recommended it be reduced to $10,000 because Apalachicola couldn't afford to pay more.

"It's a matter of fact that if the City of Tallahassee wastewater treatment facility were bad today we could not go and say, 'OK, shut it down until such time as you get it to operate (correctly),'" he said. "There are too many people depending on that as a method of treatment. We have to work through the administrative process to bring that facility into compliance."

As for the oysters, Joe Shields, an oyster inspector for the state agriculture department, said he doesn't think the plant threatens them. Water tests at the U.S. bridge, where water from Huckleberry Creek would flow, have shown high pollution, Shields said. Nevertheless, city officials and residents are meeting to find alternatives to discharging treated wastewater into Huckleberry Creek. The newly appointed environmental committee includes the Teats and a representative of the River Keeper group.

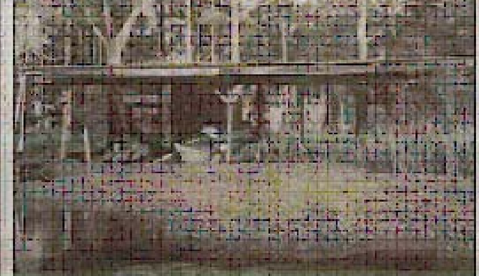
The Teats regret having to fight the city, likening it to challenging friends and family, said Wanda Teat, an Eastpoint schoolteacher.

And they believe the responsibility should not have been placed on them because they moved to Huckleberry Creek.

"We teach these kids all the time to take care of the bay because they are our future," she said. "But how do I tell children they should take care of the bay when DEP and the government is destroying it?"

BRUCE RITCHIE | Democrat

Huckleberry Creek is shown downstream from the sewage plant.



Special to the Democrat

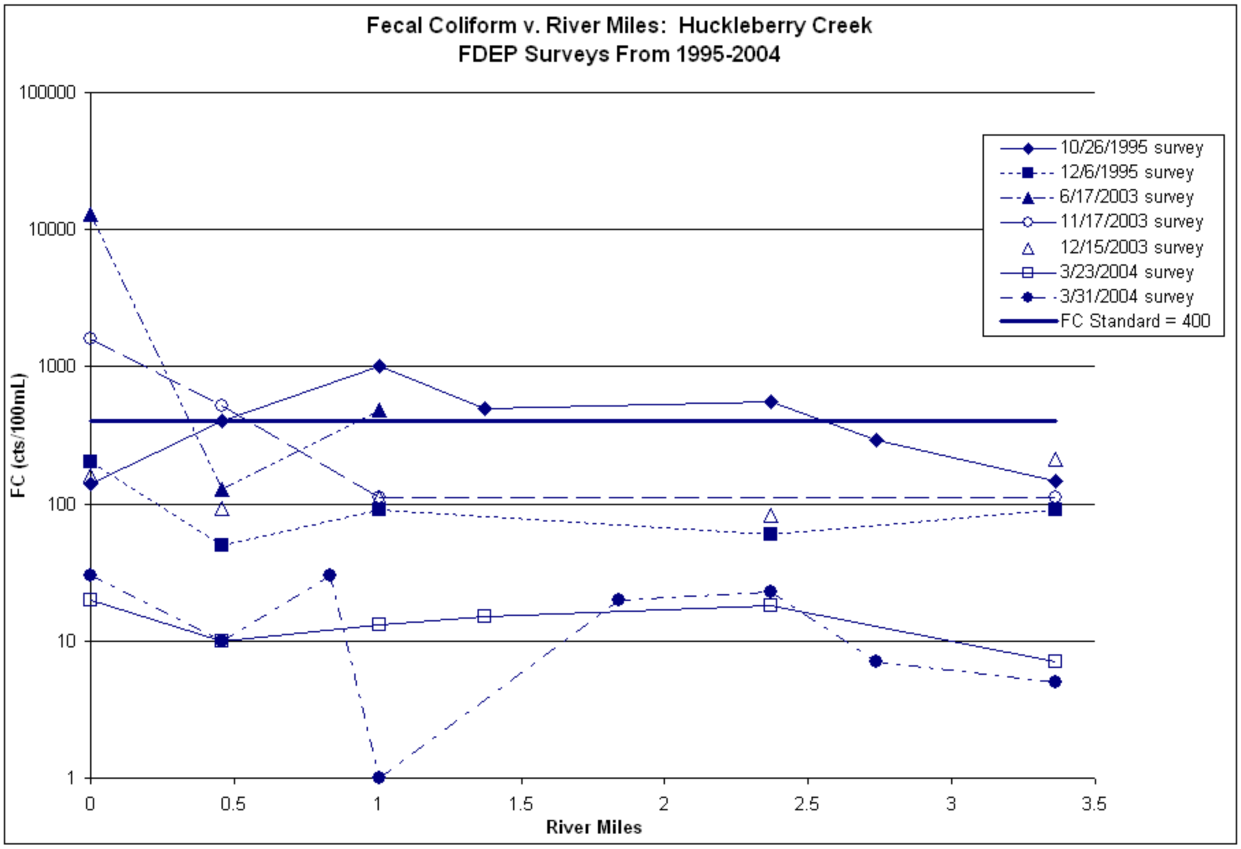
Weeds block access to Wanda and Eric Teat's boathouse.

FDEP Station 8810: Huckleberry Creek at RR (upstream view)

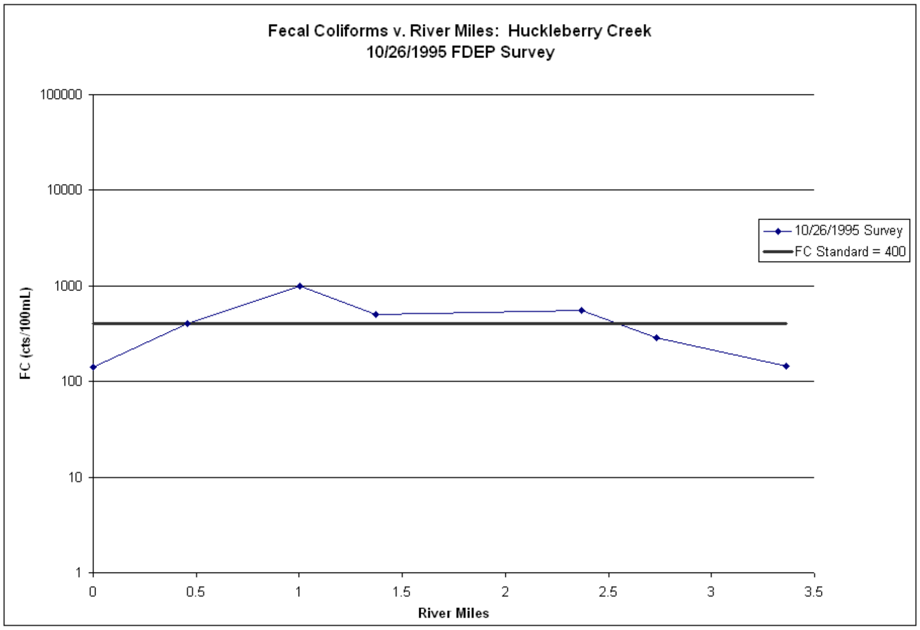
FDEP Station 8810: Huckleberry Creek at RR (downstream side of bridge)

Appendix G: Historical Summary of Huckleberry Creek Data

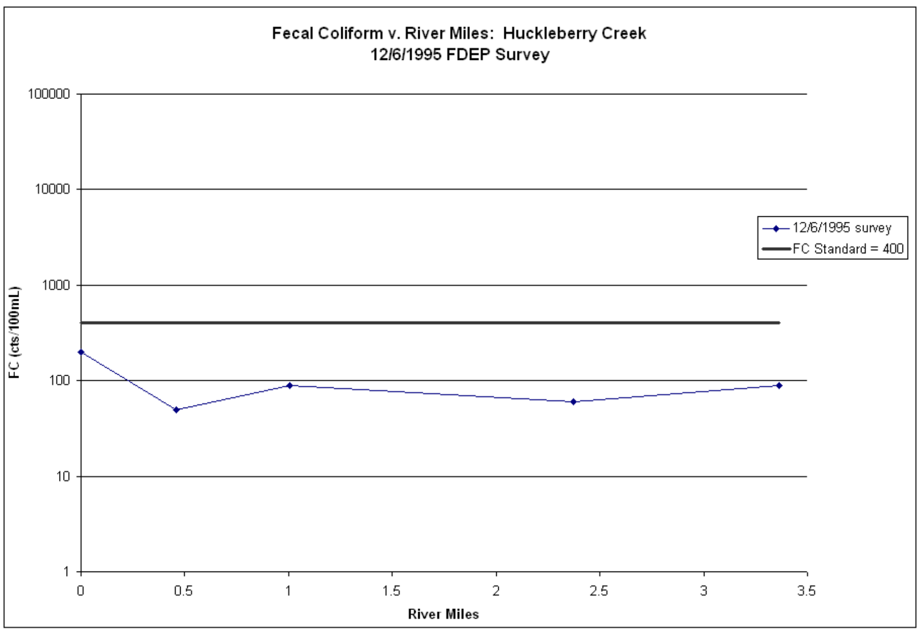
Historical data collected in the Huckleberry Creek watershed are summarized below.



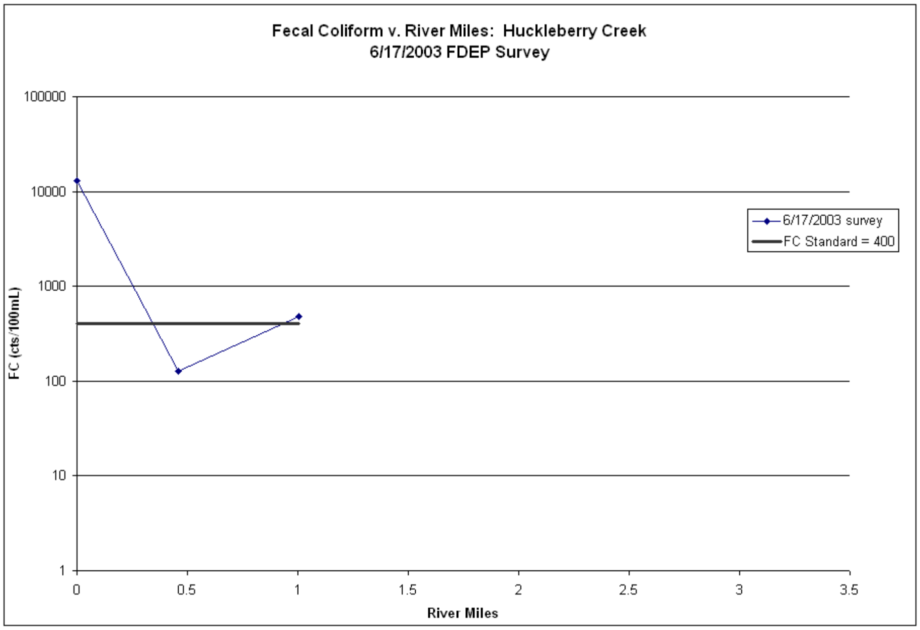
Graphs of individual surveys follow:

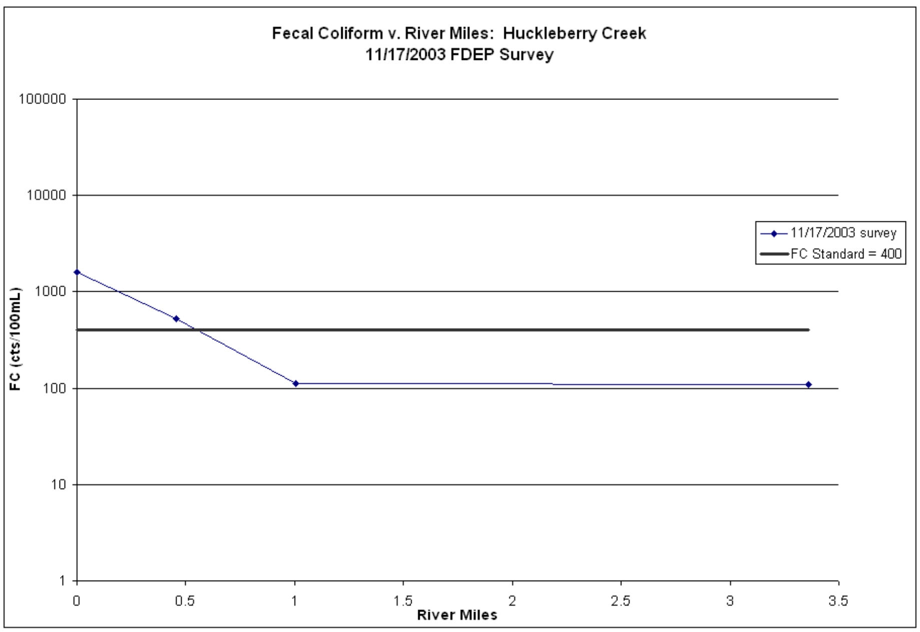


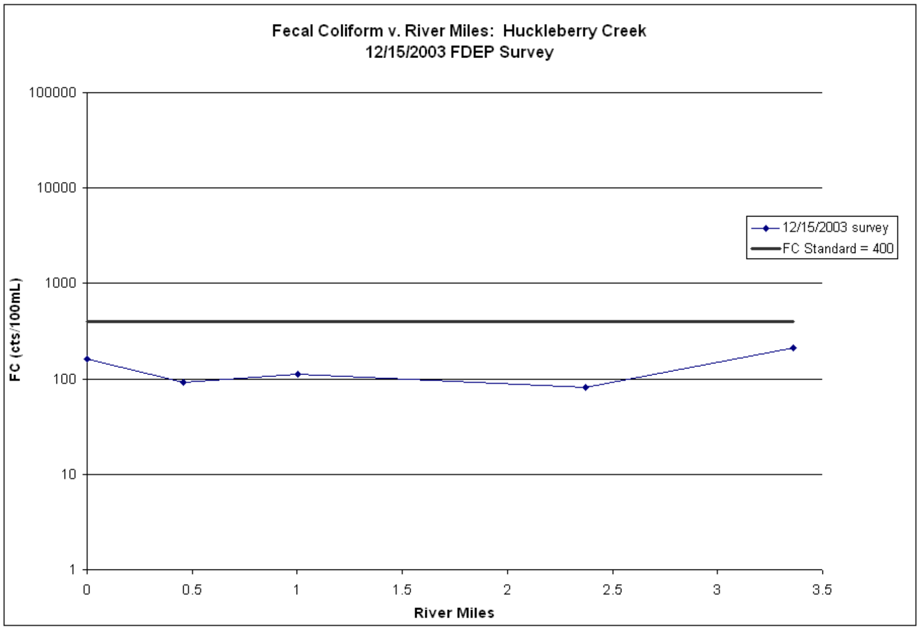
Fecal Coliforms v. River Miles: Huckleberry Creek
10/26/1995 FDEP Survey
100000
10000
1000
100
10
1
FC (cts/100mL)
0
0.5
1
1.5
2
2.5
3
3.5
River Miles
10/26/1995 Survey
FC Standard = 400

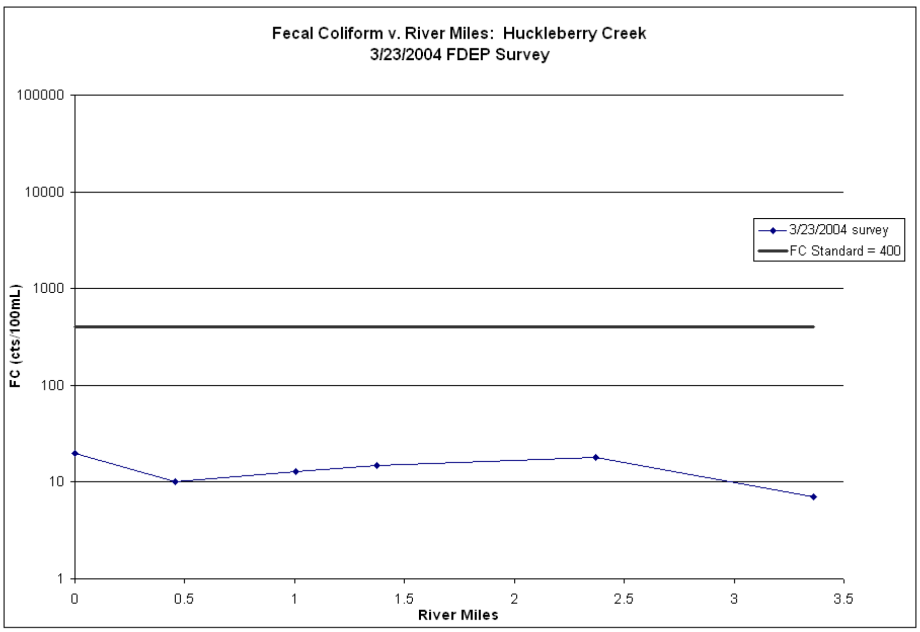


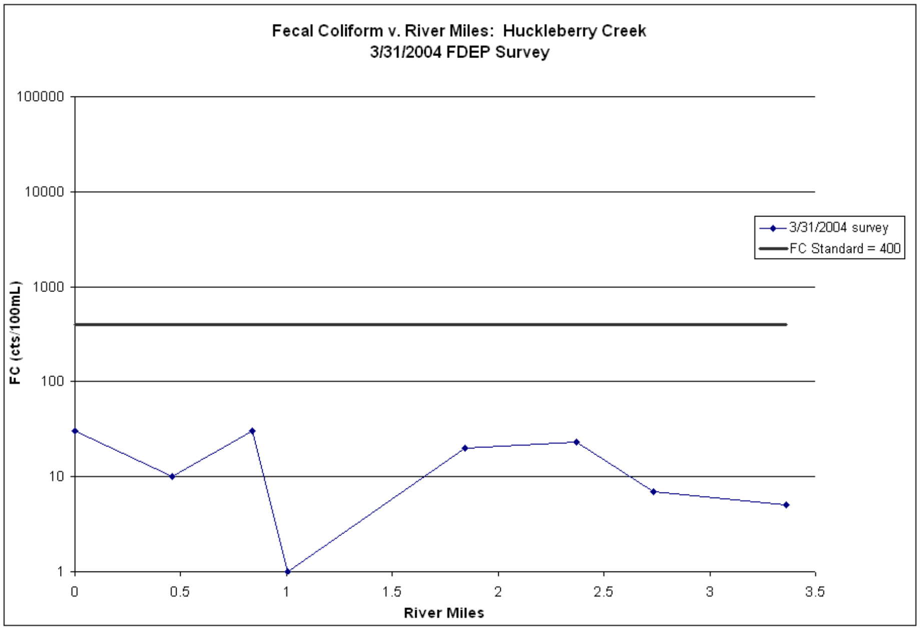
Fecal Coliform v. River Miles: Huckleberry Creek
12/6/1995 FDEP Survey
100000
10000
1000
100
10
1
FC (cts/100mL)
0
0.5
1
1.5
2
2.5
3
3.5
River Miles
12/6/1995 survey
FC Standard = 400


Fecal Coliform v. River Miles: Huckleberry Creek
6/17/2003 FDEP Survey
100000
10000
1000
100
10
1
FC (cts/100mL)
0
0.5
1
1.5
2
2.5
3
3.5
River Miles
6/17/2003 survey
FC Standard = 400


Fecal Coliform v. River Miles: Huckleberry Creek
11/17/2003 FDEP Survey
100000
10000
1000
100
10
1
FC (cts/100mL)
0
0.5
1
1.5
2
2.5
3
3.5
River Miles
11/17/2003 survey
FC Standard = 400


Fecal Coliform v. River Miles: Huckleberry Creek
12/15/2003 FDEP Survey
100000
10000
1000
100
10
1
FC (cts/100mL)
0
0.5
1
1.5
2
2.5
3
3.5
River Miles
12/15/2003 survey
FC Standard = 400

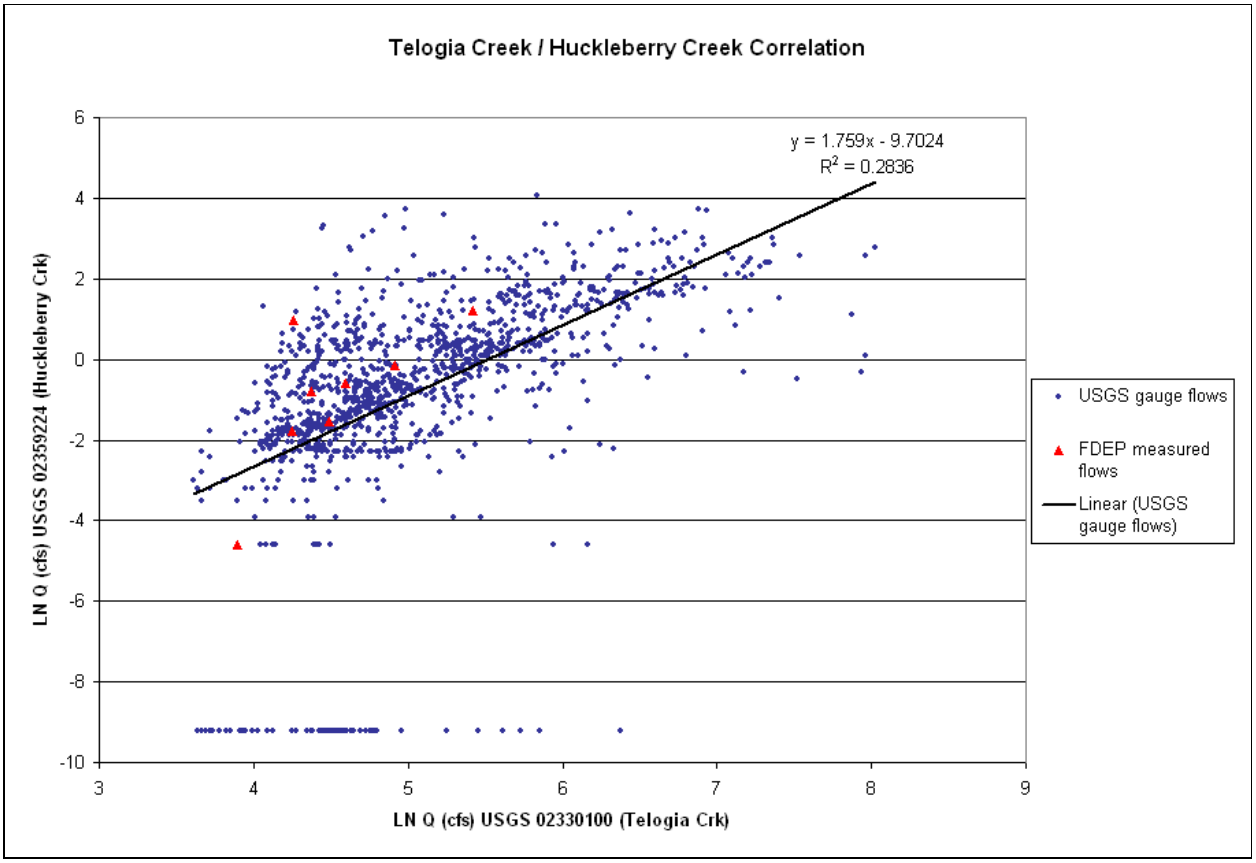

Fecal Coliform v. River Miles: Huckleberry Creek
3/23/2004 FDEP Survey
100000
10000
1000
100
10
1
FC (cts/100mL)
0
0.5
1
1.5
2
2.5
3
3.5
River Miles
3/23/2004 survey
FC Standard = 400

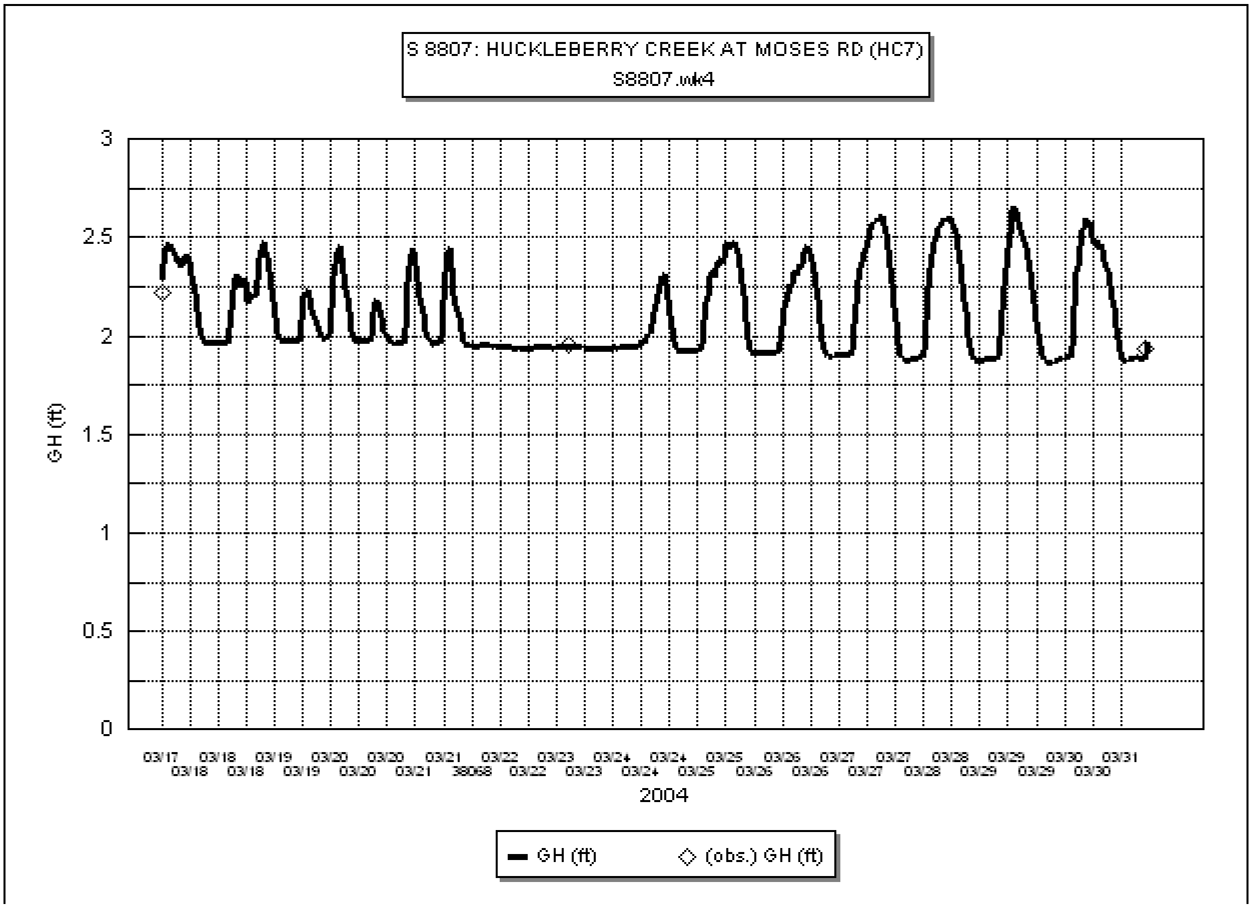


Fecal Coliform v. River Miles: Huckleberry Creek
3/31/2004 FDEP Survey
100000
10000
1000
100
10
1
FC (cts/100mL)
0
0.5
1
1.5
2
2.5
3
3.5
River Miles
3/31/2004 survey
FC Standard = 400

Appendix H: USGS and FDEP Gage and Flow Data

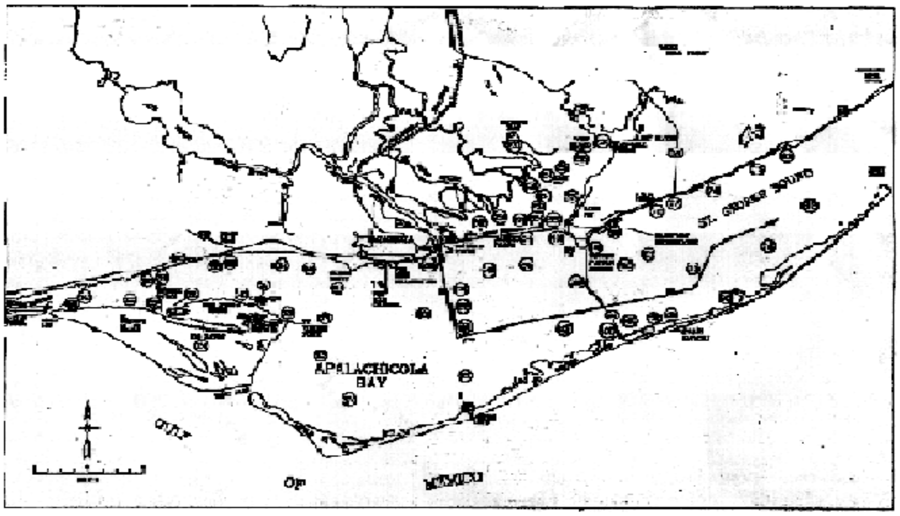
Historical data collected in the Huckleberry Creek watershed are summarized below.




S 8807: HUCKLEBERRY CREEK AT MOSES RD (HC7)
S8807.wk4
3
2.5
2
1.5
1
0.5
0
GH (ft)
03/17 03/18 03/18 03/18 03/19 03/19 03/20 03/20 03/20 03/21 03/21 38068 03/22 03/22 03/23 03/23 03/24 03/24 03/24 03/25 03/25 03/26 03/26 03/26 03/27 03/27 03/27 03/28 03/28 03/29 03/29 03/29 03/30 03/30 03/31
2004
GH (ft)
(obs.) GH (ft)

Appendix I: Ground Water Data in the Apalachicola–Chipola Basin

A map of groundwater monitoring sites is presented below, along with a table of related statistics.

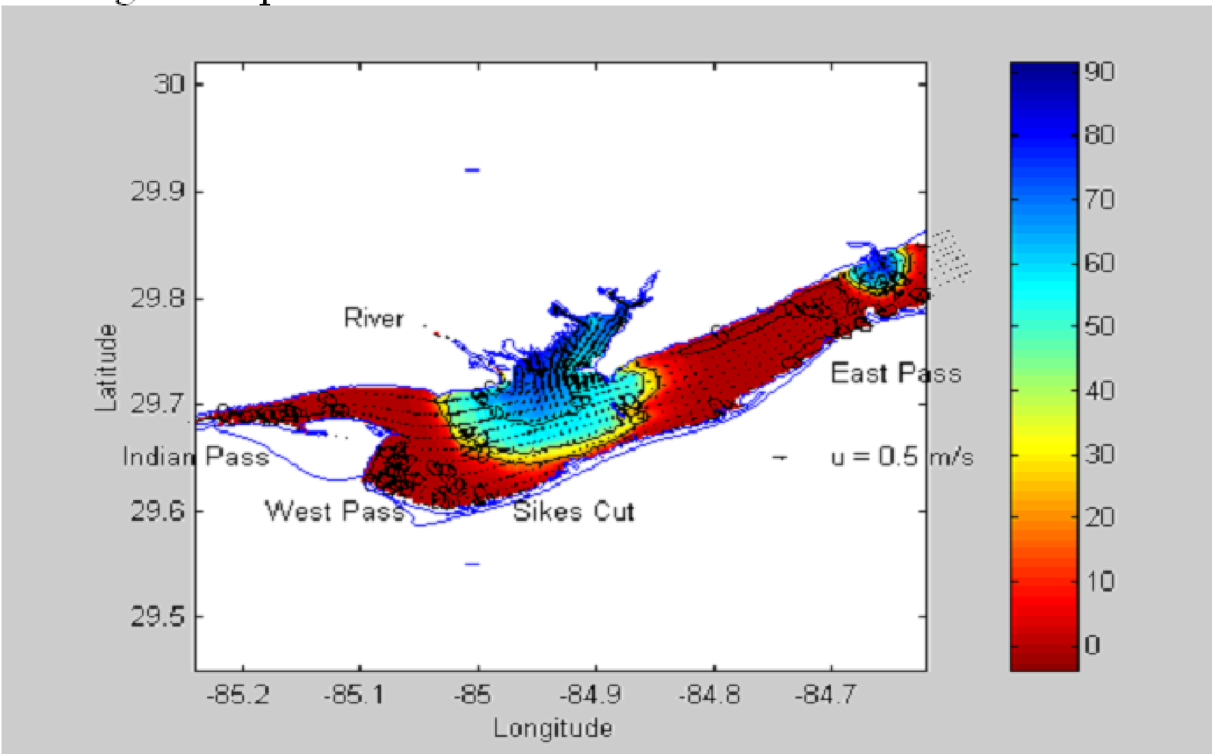


AllNetworks->'APALACHICOLA - CHIPOLA'->CONFINED/UNCONFINED AQUIFER-> BIOLOGICAL					
Parameter Name	**Coliform, Fecal (MF)**	**Coliform, Total (MF)**	**Coliform, Total (MPN)**	**Enterococci, Membrane Filter**	**Escherichia coli, Membrane Filter**
Parameter Code	31616	31501	31507	31649	31648
Units	#/100ml	#/100ml	#/100ml	#/100ml	#/100ml
Total Wells	92	48	47	58	48
Number BDLs	83	43	35	55	47
Number MCL/GCL Exceedances	N/A	5	9	N/A	N/A
Percent MCL/GCL Exceedances	N/A	10.42%	19.15%	N/A	N/A
Minimum	0	0	1	0	0
1st Quartile	0	0	1	0	0
Median	0	0	1	0	0
3rd Quartile	0	0	1.5	0	0
Maximum	850	70	30	42	2
Interquartile Range	0	0	0.5	0	0
Mean	10.17	3.71	3.26	0.83	0.04
Standard Deviation	88.68	12.94	5.91	5.53	0.29
Relative Standard Deviation	871.70%	348.80%	181.70%	668.40%	692.80%
Standard Error	9.25	1.87	0.86	0.73	0.04
Variance	7864.32	167.32	34.98	30.6	0.08
Coefficient of Skewness	344.2	860.1	1144	448.8	433
Individual Results					
QA Results					
Number Risk Indicators	7	N/A	N/A	3	1
Percent Risk Indicators	7.61%	N/A	N/A	5.17%	2.08%
Number SRA Indicators	1	0	0	0	0
Percent SRA Indicators	1.09%	0.00%	0.00%	0.00%	0.00%

Appendix J: Modeling Studies in the Apalachicola–Chipola Basin

The Level II WQBEL study (Young, 2000) will develop a model of tidal flushing in Huckleberry Creek based on cross-section and elevation data collected in the spring and summer of 2004. Previous modeling studies of Apalachicola Bay (Huang, 1997) and Apalachicola River (U.S. Army Corps of Engineers, 1999) did not extend their model boundaries to include the Huckleberry Creek system.

A sample simulation of total coliform (TC) concentration in Apalachicola Bay using 3D EFDC and WASP engine. Assume loading 100 (num/100 ml) loading from Apalachicola River and Carrabelle River.



Florida Department of Environmental Protection
Division of Water Resource Management
Bureau of Watershed Management
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