FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

NORTHEAST DISTRICT • LOWER ST. JOHNS BASIN

TMDL Report

Fecal Coliform TMDL for Durbin Creek (WBID 2365)

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Florida Department of Environmental Protection

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TMDL Program

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

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

STORET Program

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

2000 305(b) Report

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

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Basin Status Report for the Lower St. Johns River Basin

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Water Quality Assessment Report for the Lower St. Johns River Basin

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Allocation Technical Advisory Committee (ATAC) Report

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

U.S. Environmental Protection Agency, National STORET Program

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

Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for fecal coliforms for the Durbin Creek watershed in the Julington Creek Planning Unit. The creek was verified as impaired for fecal coliforms, and was included on the Verified List of impaired waters for the Lower St. Johns River Basin that was adopted by Secretarial Order in May 2004. The TMDL establishes the allowable loadings to Durbin Creek that would restore the waterbody so that it meets its applicable water quality criteria for fecal coliforms.

1.2 Identification of Waterbody

Durbin Creek is located in southern Duval County and northern St. Johns County, in northeast Florida, with an approximate 26.2 square-mile (mi^2) drainage area that drains directly into Julington Creek (**Figures 1.1 and 1.2**). The creek is approximately 4.0 miles long and is a second order stream. The Durbin Creek basin is located on the southeastern edge of Duval County near the Mandarin area and in northeastern St. Johns County in an area experiencing increased development pressure. Durbin Creek flows predominantly southwest into Julington Creek. Additional information about the creek's hydrology and geology are available in the Basin Status Report for the Lower St. Johns River Basin (Florida Department of Environmental Protection [FDEP], 2004).

For assessment purposes, the Department has divided the St. Johns River Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. Durbin Creek consists of segment 2365 as shown in **Figure 1.2**, which this TMDL addresses.

Durbin Creek is part of the Julington Creek Planning Unit (PU). Planning units are groups of WBIDs within the larger basin unit, in this case the Lower St. Johns Basin. The Julington Creek Planning Unit consists of 14 WBIDs. **Figure 1.3** shows the location of these WBIDs, Durbin Creek's proximity in the planning unit, and a list of other WBIDs in the PU. Major tributaries in the Julington Creek Planning Unit include Julington Creek, Durbin Creek, Big Davis Creek, Sampson Creek, Oldfield Creek, and Flora Branch.

Figure 1.1. Location of Durbin Creek (2365) and Major Geopolitical Features in the St. Johns River Basin

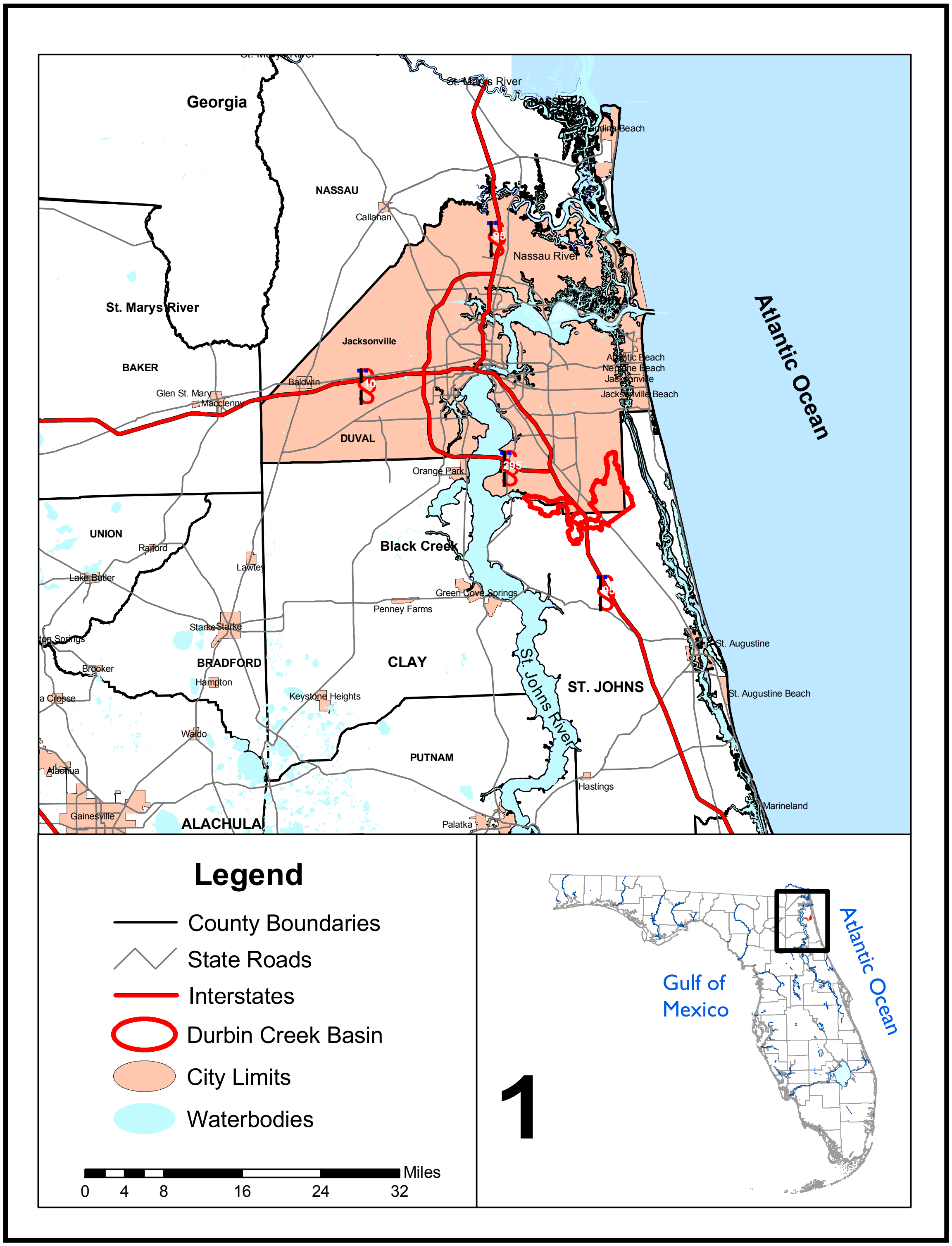


Figure 1.2. Durbin Creek WBID

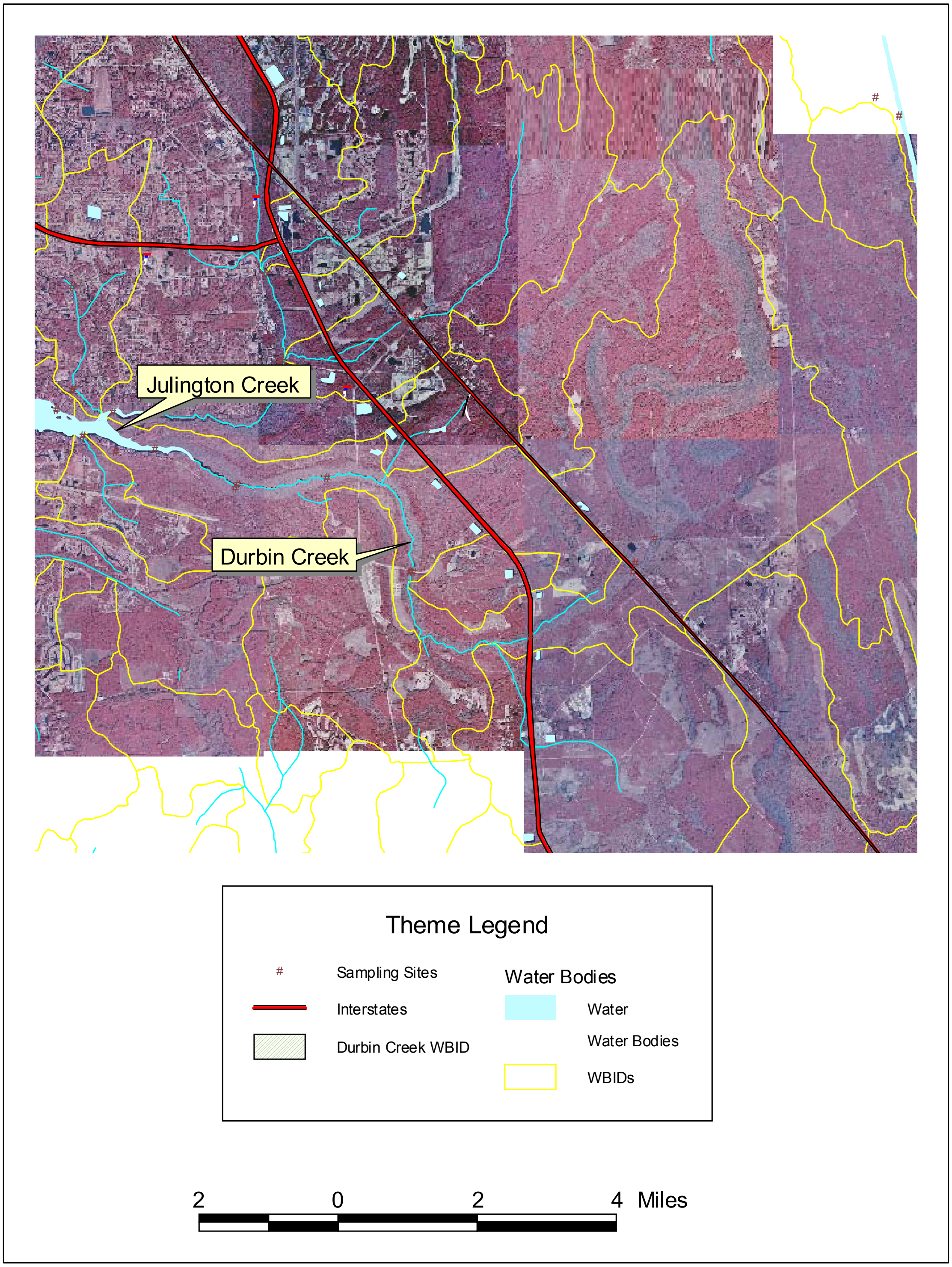
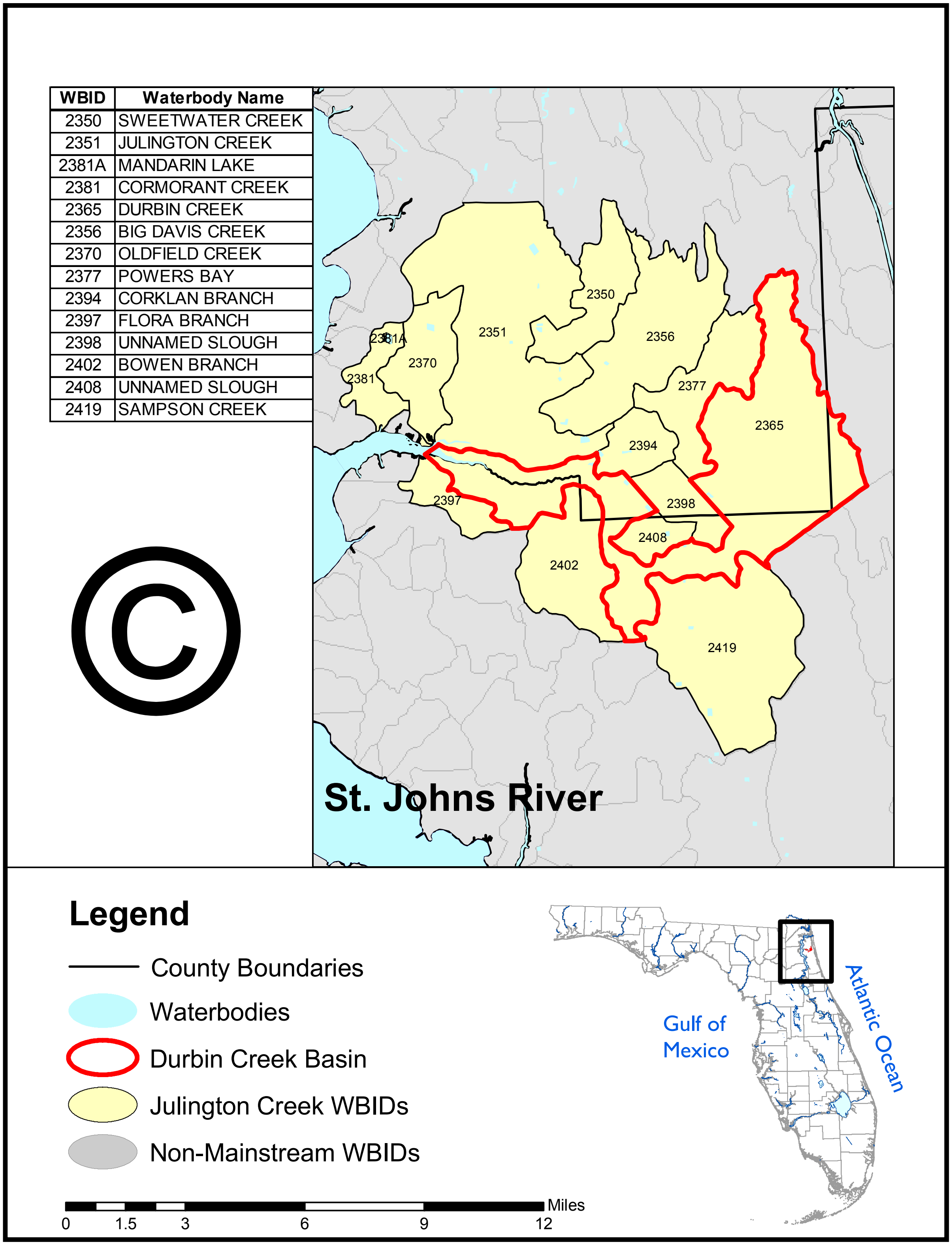


Figure 1.3. WBIDs in the Julington Creek Planning Unit



WBID	Waterbody Name
2350	SWEETWATER CREEK
2351	JULINGTON CREEK
2381A	MANDARIN LAKE
2381	CORMORANT CREEK
2365	DURBIN CREEK
2356	BIG DAVIS CREEK
2370	OLDFIELD CREEK
2377	POWERS BAY
2394	CORKLAN BRANCH
2397	FLORA BRANCH
2398	UNNAMED SLOUGH
2402	BOWEN BRANCH
2408	UNNAMED SLOUGH
2419	SAMPSON CREEK

1.3 Background

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

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 coliforms that caused the verified impairment of Durbin Creek. These activities will depend heavily on the active participation of the St. Johns River Water Management District, the City of Jacksonville, Jacksonville Electric Authority (JEA), 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 source in each of these impaired 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 55 waterbodies and 277 parameters in the Lower St. Johns River Basin. However, the Florida Watershed Restoration Act (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 Durbin Creek and verified the creek is impairmed for fecal coliforms based on data in the Department's IWR database.   The projected year for the TMDL was 2004, but the Settlement Agreement between EPA and Earthjustice, which drives the TMDL development schedule for waters on the 1998 303(d) list, allows an additional nine months to complete the TMDLs.   As such, this TMDL must be adopted and submitted to EPA by September 30, 2005.

Tables 2.1 through **2.3** provide summary results for fecal coliforms for the verification period, which for Group 2 waters is January 1, 1996 – June 30, 2003, by month, season, and year, respectively.

Table 2.1. Summary of Coliform Data by Month for Verified Period (January 1, 1996 – June 30, 2003)

Fecal Coliforms

Month	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
January	13	30	1300	230	481	6	46.15%	3.76
February	7	52	1300	1000	689	4	57.14%	5.17
March	16	4	1100	23.5	236	3	18.75%	2.07
April	3	56	184	64	101	0	0.00%	0.47
May	7	20	220	80	97	0	0.00%	4.46
June	4	20	1300	130	395	1	5.00%	7.42
July	9	20	300	90	126	0	0.00%	5.05
August	16	20	2200	150	568	4	25.00%	11.70
September	11	20	220	50	74	0	0.00%	3.43
October	12	20	4700	900	1466	7	58.33%	2.01
November	4	20	300	180	170	0	0.00%	2.25
December	13	30	1300	230	481	6	46.15%	3.76

Coliform counts are #/100 mL
Exceedances represent values above 400 counts/100 mL for fecal coliforms,
Mean precipitation is for Jacksonville International Airport (JIA) in inches

Table 2.2. Summary of Coliform Data by Season for Verified Period (January 1, 1996 – June 30, 2003)

FECAL COLIFORMS

Season	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
WINTER	20	30	1300	365	554	10	50.00%	2.62
SPRING	26	4	1100	80	183	3	11.54%	9.05
SUMMER	29	20	2200	130	407	5	17.24%	2.53
FALL	27	20	4700	100	707	7	25.92%	4.25

Coliform counts are #/100 mL
Exceedances represent values above 400 counts/100 mL for fecal coliforms
Mean precipitation is for Jacksonville International Airport (JIA) in inches

Table 2.3. Summary of Coliform Data by Year for Verified Period (January 1, 1996 – June 30 2003)

FECAL COLIFORMS

Year	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
1996	1	220	220	220	220	0	0.00%	11.46
1997	3	20	20	20	20	0	0.00%	3.97
1998	9	20	1300	110	300	2	22.22%	4.21
1999	24	20	1300	85	265	4	16.67%	3.33
2000	22	20	2200	220	528	8	36.36%	4.90
2001	25	10	4700	120	939	10	40.00%	6.43
2002	18	4	1094	72	126	1	5.56%	4.12

Table represents years for which data exists
Coliform counts are #/100 mL
Exceedances represent values above 400 counts/100 mL for fecal coliforms
Mean precipitation is for Jacksonville International Airport (JIA) in inches

Historical fecal coliform observations in the Cedar River can be found in **Appendix A**. Coliform data has been presented by month, season, and year to determine whether certain patterns are evident in the data set. For example, are coliform levels elevated during certain months or seasons that are historically wetter periods of the year? Is there a trend over time in coliform levels?

A non-parametric test (Kruskal-Wallis) was applied to the fecal coliform dataset to determine whether there were significant differences among months or seasons. At an alpha (α) level of 0.05, there were significant differences among months for fecal coliforms but not among seasons (**Appendices B and C**). In the months of December, January, and February, exceedance rates were greater than 45 percent. In April – July, there were few or no exceedances, however, sampling sizes were much smaller than many of the other months. For example, there were only between 3 and 9 observations for the months April – July, while months like December and January had 13 observations. The winter season (January – March) had the highest exceedance percentage, however, the seasons were not statistically different at an alpha (α) level of 0.05.

Rainfall records for the Jacksonville International Airport (**Appendix D** illustrates rainfall from 1990 – 2004) were used to determine rainfall amounts associated with individual sampling dates. Rainfall recorded on the day of sampling (1D), the cumulative total for the day of and the previous two days (3D), the cumulative total for the day of and the previous six days (7D), as well as the total rainfall for the month that sampling occurred were all paired with the respective coliform observation. A spearman correlation matrix was generated that summarized the simple correlation coefficients between the various rainfall and coliform measures (**Appendix E**). The simple correlations (r values in the Spearman Correlation table) between coliforms and various rainfall totals were positive, suggesting that as rainfall (and possible runoff) increased, so did the number of coliforms.

Simple linear regressions were performed between the coliform observation and rainfall total to determine whether any of the relationships were significant at an α level of 0.05. Although the r^2 values were low, the correlations between fecal coliforms and the 3D, 7D, and the monthly rainfall total were significant. (**Appendix F**). The historical plot of monthly average rainfall (**Appendix D**) indicates that monthly rainfall totals increase in June and peak in September and by October return to levels observed in February and March.

Appendix D also includes a graph of annual rainfall over the 1949 – 2003 period versus the long-term average (52.41 inches) over this period. The years of 1996 – 1998 represented above average rainfall years, while the years 1999 – 2001 were below average, and 2002 was again above average. In general, the fecal coliform percent exceedances by year followed an inverse pattern, with lower percent exceedance occurring during the above average rainfall years and higher exceendance percentages during below average rainfall years.

Observations at individual stations were too limited to determine any spatial trends or patterns along the stream. Some of the correlations with rainfall totals over longer periods may be associated with the large fraction of the WBID that is described as wetland and forested. The wetlands and forested areas can help attenuate increased flows from storm events and result in a longer and more gradual flow response.

Chapter 3. 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)**

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

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

3.2.1 Fecal Coliform Criterion

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

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

The criteria state that monthly averages shall be expressed as geometric means based on a minimum of ten samples taken over a thirty-day period. However, there were insufficient data (less than 10 samples in a given month) available to evaluate the geometric mean criterion for fecal coliform bacteria. Therefore, the criterion selected for the TMDLs was not to exceed 400 counts/100 ml..

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

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

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

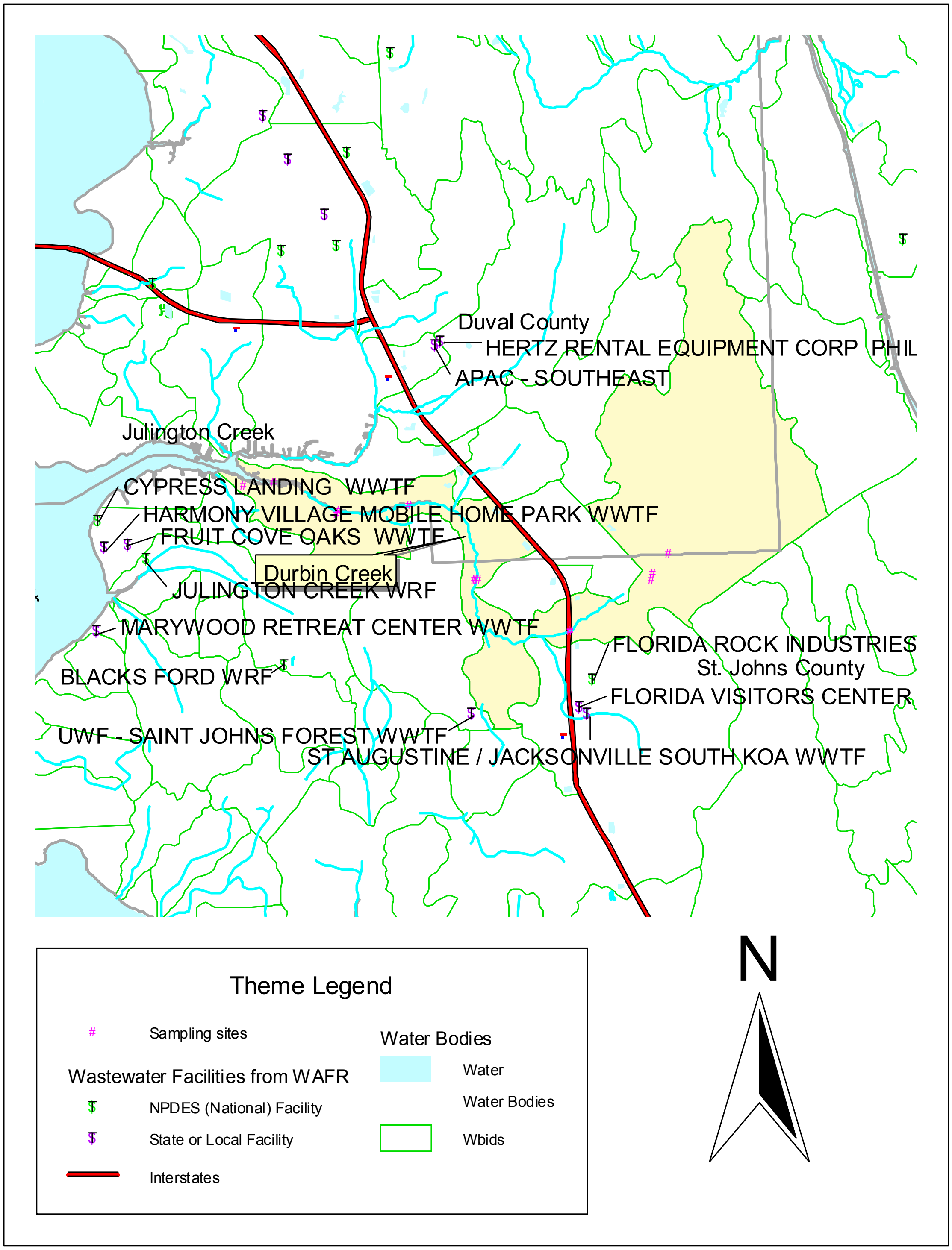
To be consistent with Clean Water Act definitions, the term "point source" will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) **AND** stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see **Section 6.1**). However, the methodologies used to estimate non-point 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 Coliforms in Durbin Creek Watershed

4.2.1 Point Sources

There are no NPDES wastewater facilities authorized to discharge into Durbin Creek. However, there are several wastewater facilities within the WBIDs surrounding the Durbin Creek WBID that have NPDES discharge permits (**Figure 4.1).** A very small portion of the Durbin Creek watershed is within the service area of the Mandarin WWTF, while the Julington Creek WWTF provides service to part of the southwestern fraction of the Durbin Creek Watershed.

Figure 4.1. Location of Permitted Facilities within the Durbin Creek Watershed



Municipal Separate Storm Sewer System Permittees

The City of Jacksonville and the Florida Department of Transportation District 2 are co-permittees for a Phase I NPDES municipal separate storm sewer system (MS4) permit (permit FLS000012) that covers the Durbin Creek watershed. A stormwater utility has not been established at this time in Duval County or the City of Jacksonville. St. Johns County is a permitted Phase II NPDES MS4 (permit FLR04E025). St. Johns County also does not have a stormwater utility.

4.2.2 Land Uses and Nonpoint Sources

Additional coliform loadings to Durbin Creek are generated from nonpoint sources in the basin. Potential non-point sources of coliforms include loadings from surface runoff, wildlife, pets, leaking or overflowing sewage lines, and leaking septic tanks.

Land Uses

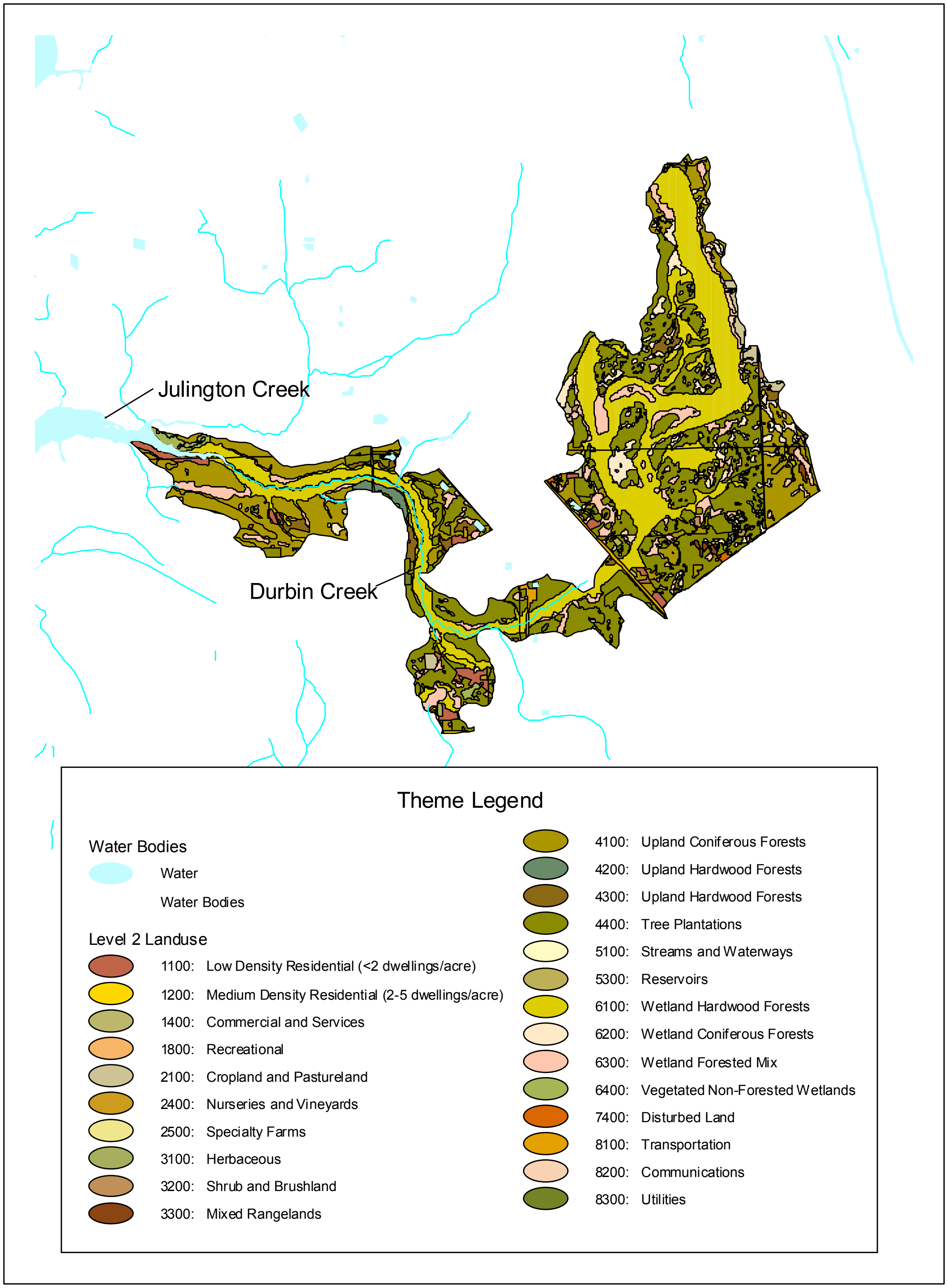
The spatial distribution and acreage of different land use categories were identified using the 2000 land use coverage contained in the Department's Geographic Information System (GIS) library, initially provided by the SJRWMD. Land use categories and acreages in the watershed were aggregated using the Level 2 codes as illustrated in **Figure 4.2**. For ease of presentation, land use based on Level 1 codes are tabulated in **Table 4.1.**

The Durbin Creek watershed is a small and relatively undeveloped area. As shown in **Table 4.1**, nearly half of the land is upland forest (49.7 percent), followed by wetlands (44.1 percent), while urban and built up is less than 2 percent (1.9 percent). Wetlands, water, and upland forest areas comprise nearly 95% of the watershed.

Table 4.1. Classification of Land Use Categories in the Durbin Creek Watershed

Level 1 Land Use Code	Attribute	Area (mi^2)	Percent of Total
1000	Urban and built up	0.490	1.87
2000	Agriculture	0.350	1.33
3000	Upland nonforested	0.187	0.71
4000	Upland forests	13.032	49.66
5000	Water	0.259	0.99
6000	Wetlands	11.586	44.15
7000	Barren land	0.041	0.16
8000	Transportation, communication, and utilities	0.295	1.12
	TOTAL:	**26.241**	**100.00%**

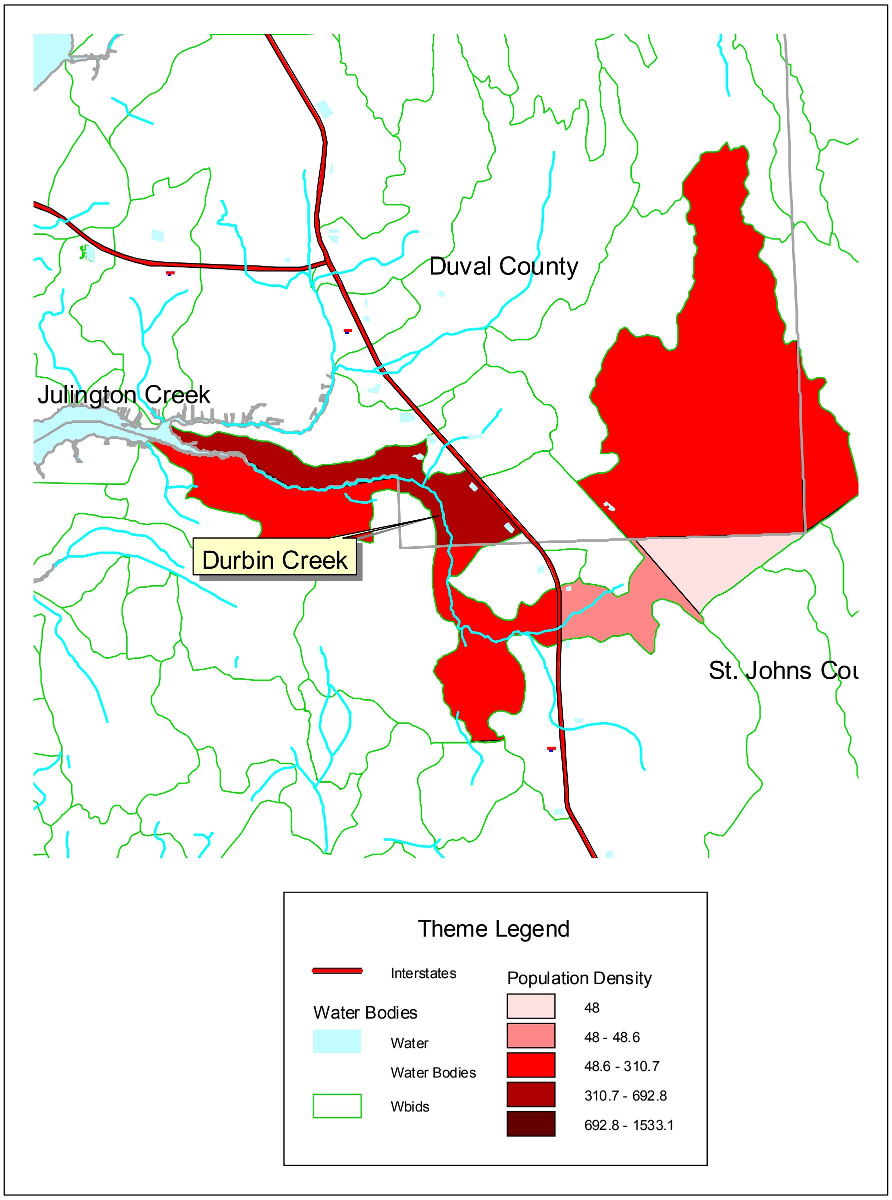
Figure 4.2. Principal Land Uses in the Durbin Creek Watershed



Population

According to the U.S Census Bureau, census block population densities in the Durbin Creek watershed in the year 2000 ranged from 48 – 1,533 persons per square mile, with an average 262 persons per square mile in the watershed **(Figure 4.3)**. Based on this average density, the estimated population in the Durbin Creek watershed would be 6,874.

Figure 4.3. Population Density in the Durbin Creek Watershed



Septic Tanks

It is estimated that approximately 57 percent of residences within Duval County are connected to a wastewater treatment plant, with the rest utilizing septic tanks (Department of Revenue cadastral data, 2003, and Florida Department of Health Website). The Florida Department of Health (DoH) reports that as of fiscal year 2003-2004, there were 88,834 permitted septic tanks in Duval County (Florida DoH Web site). From fiscal years 1993 – 2004, 5,479 permits for repairs were issued (Florida DoH Web site). In St. Johns County as of fiscal year 2003 -2004, there were 27,351 permitted septic tanks, and over the 1993 – 2004 period, there were 3,393 permits for repair issued. Based upon the 2000 Census of homes in St. Johns County and the number of permitted septic tanks, approximately 53% of the residences in St, Johns County are connected to a wastewater treatment plant.

Portions of the Durbin Creek watershed and surrounding areas are serviced by the Mandarin and Julington Creek WWTFs. Since the watershed includes portions of both Duval County and St. Johns County, it was necessary to estimate the number of residences in the Durbin Creek watershed by identifying the 2000 Census tracts that covered the watershed and estimating the fraction of each tract within the watershed. Using this approach, there were an estimated 2,652 households in the Durbin Creek watershed. The average household in the Durbin Creek watershed is 2.59 persons (see **Table 4.2**).

To estimate the number of possible septic tank failures per year within the Durbin Creek Basin, the following approach was followed. In Duval County there were 5,479 repair permits issued over 12 years. This represents 457 repair permits/yr. Urban and built-up land in Duval County based on 2000 level 1 land use was 225.9 miles^2. Assuming that septic tanks are primarily located in this land use category yielded an estimate of 2 repair permits/yr/mile^2. Using the same procedure for St. Johns County information yielded 283 repair permits/yr which, when applied over 59.2 mile^2 of urban and built up land yielded 5 repair permits/yr/mile^2. Using the more conservative value of 5 failures/yr/mile^2 over the 0.49 mile^2 of urban and built-up area in Durbin Creek gives an estimate of 3 failures/yr. With 3 septic tank failures, 2.59 people per household, and using 70 gallons/day/person (U.S. Environmental Protection Agency [USEPA], 2001), a potential loading of 2.06 x 10^{10} fecal colonies/day is derived. This estimation is shown in **Table 4.3.**

Table 4.2. Estimation of Average Household Size in the Durbin Creek Watershed

Household Size	No. of Households	Percentage of Total	Number of People
1-person household	570	21.49%	570
2-person household	921	34.73%	1,842
3-person household	475	17.91%	1,425
4-person household	466	17.57%	1,864
5-person household	164	6.18%	820
6-person household	39	1.47%	234
7-or-more-person household	17	0.64%	119
TOTAL:	**2,652**	**100.00%**	**6,874**
		AVERAGE HOUSEHOLD SIZE:	**2.59**

Data from U.S. Census Bureau web site, 2005, based on Duval County and St. Johns County tracts which are present in the Durbin Creek watershed

Table 4.3. Estimation of Daily Fecal Coliform Loading from Failed Septic Tanks in the Durbin Creek Watershed

Estimated Population Density and Area	WBID Area (mi^2)	Estimated Population in Watershed	Estimated Number of Tank Failures[1]	Estimated Load From Failed Tank[2]	Gallons/ Person/ Day[2]	Estimated Number Persons Per Household[3]	Estimated Load From Failing Tanks
262 persons/mi^2 in WBID 2365	26.24	6,874	3	1.00×10^4/mL	70	2.59	2.06×10^{10}

[1] Based on septic tank repair permits issued in the watershed from August 1993 – April 2004 (Fl. DoH – see text

[2] From EPA document "Protocol for Developing Pathogen TMDLs."

[3] From U.S Census Bureau, see Table 4.2 for more information on this estimate.

Agriculture

At the level 3 land use category, seven agricultural codes were identified in the Durbin Creek watershed, however the total acreage for agricultural land use was very small. Improved pasture was the largest agricultural category and represented approximately 0.75% of the watershed area (127 acres). Unimproved and woodland pastures represented less than 0.17% of the watershed area. Field and row crops totaled less than 0.32% of the watershed area while ornamentals represented less than 0.04% of the watershed area. Finally, horse farms represented approximately 0.02% of the watershed or 3.4 acres. Assuming that the improved pasture is primarily used to raise cattle, and there are 1 beef cattle per three acres this could represent potential fecal coliform loadings of 4.20×10^{12} organisms/day (**Table 4.4**).

Table 4.4. Estimated Agricultural Loading in the Durbin Creek Watershed.

Coliforms	Improved Pasture Acreage	Beef Cattle per three Acres	Estimated No. of Cattle	Estimated Counts/Cow/Day	Estimated Counts/Day
Fecals	127	1	42	1×10^{11}	4.20×10^{12}

Pets

The Department has been unable to obtain data on the number of dogs in the area; however estimates can be made based upon information from the American Veterinary Medical Association (AVMA). Using this information yields a potential fecal coliform loading from dogs of 4.78×10^{12} organisms/day (**Table 4.5**).

Table 4.5. Estimated Loading From Dogs in the Durbin Creek Watershed

Pet	Estimated No. of Households in 2365	Estimated Person:Pet Ratio[1]	Estimated No. of Pets	Estimated Counts/Pet/Day	Estimated Counts/Day
Dogs	2,652	0.361	957	5×10^9	4.78×10^{12}

[1] From the American Veterinary Medical Association website, which states the original source to be the "U.S Pet Ownership and Demographics Sourcebook," 2002.

Leaking or Overflowing Wastewater Collection Systems

As noted previously, 57% of households in Duval County and 53% of households in St. Johns County are connected to wastewater facilities. Based on the census track information, there were 2,275 homes in the Duval County portion of the watershed and 378 homes in St. Johns portion of the watershed. Applying the respective fractions of homes on sewer to each component yields a total of 1,496 homes on sewer. Using 2.59 people per home, and a 70 gallon per person per day discharge, a daily flow of approximately 1.026×10^6 L is transported through the collection system. The EPA Protocol for Developing Pathogen TMDLs (EPA, 2001) suggests that a 5% leakage rate from collection systems is realistic. Based on this and EPA values for fecal coliforms in raw sewage yield potential loadings of fecal coliforms of 2.57×10^{12} organisms/day (**Table 4.6**).

Table 4.6. Estimated Loading from the Wastewater Collection Systems

Coliforms	Estimated Homes on Central Sewer	Estimated Daily Flow (L)	Daily Leakage (L)	Raw Sewage Counts/100ml	Estimated Counts/Day
Fecals	1,496	1.026×10^6	5.133×10^4	5×10^6	2.57×10^{12}

4.3 Source Summary

Table 4.7 summarizes the estimated fecal coliforms loading from various sources. It is important to note that this is not a complete list (wildlife for example is missing) and represents estimates of potential loadings. Wetlands, water, and upland forests represented nearly 95% of the landuse and significant wildlife populations would be expected to be present. Proximity to the waterbody, rainfall frequency and magnitude, and temperature are just a few of the factors that could influence and determine the actual loadings from these sources that reach the Durbin Creek. For example, where are the improved pasture areas relative to Durbin Creek, is there a riparian buffer area between the pasture and the stream, can cattle directly access the stream, or is there some type of surface conveyance where animal waste can be transported to Durbin Creek? Similarly, what percentage of pet owners pick up their pet's waste, or what percentage of homes with pets are located adjacent to Durbin Creek or a drainage ditch to the river? Finally, what is the age of the collection system, has it been monitored for structural integrity, does the collection system cross Durbin Creek, or is it adjacent to portions of Durbin Creek?

Table 4.7. Summary of Estimated Potential Coliform Loading From Various Sources the Durbin Creek Watershed

Source	Fecal Coliforms
Septic Tanks	2.06×10^{10}
Agriculture	4.20×10^{12}
Pets	4.87×10^{12}
Collection Systems	2.57×10^{12}

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

No long-term stream flow information was available on Durbin Creek; therefore the load duration curve method could not be applied in this circumstance. To determine the required reduction for this TMDL, the required percent reduction that would be required for each of the exceedances was determined using all available data, and the percent reduction required to meet the state fecal coliform standard of 400 counts/100 mL was determined. The median value of all of these reductions determined the overall required reduction, and therefore the TMDL.

5.1.1 Data Used in the Determination of the TMDL

There are seven sampling stations in Durbin Creek that have historical fecal coliform observations. The primary collector of historical data is the City of Jacksonville, which maintained routine sampling sites at I-95, Racetrack Road, and U.S. 1 (STORET IDs: DUC!, DUC3, and DUC4). Some data was also collected by the SJRWMD and the Department. The creek was sampled quarterly for the most part from 1991 – 2002 by the City of Jacksonville. **Tables 5.1** shows data collection information for each of the stations, and **Table 5.2** provides summary information from the stations. **Figure 5.1** show the location of the sample sites. **Figures 5.2** and **5.3** are charts showing the observed historical data analysis, and **Appendix A** contains the historical fecal coliform observations from the sites.

Table 5.1. Summary of Station for Durbin Creek, WBID 2365

Station	STORET ID	Station Owner[1]	Years With Data	N
FECAL COLIFORM				
21FLA 20030663	DURBIN CREEK AT US HWY 1	FDEP	2001, 2002	9
21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD	FDEP	2001, 2002	6
21FLJXWQDUC1	DURBIN CREEK AT I-95	COJ	1991-1995, 1997-2000	37
21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	COJ	1991-2002	56
21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	COJ	1991-2002	49
21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	COJ	1991-1995	19
21FLSJWMLSJ087	DURBIN CREEK AT RACETRACK ROAD	SJRWMD	1992-1995	13

[1]FDEP = Fl. Dept. of Env. Prot.; COJ = City of Jacksonville; SJRWMD = St. Johns River Water Management District

Table 5.2. Statistical Table of Observed Historical Data for Durbin Creek

FECAL COLIFORM							
Station	**N**	**Minimum**	**Maximum**	**Median**	**Mean**	**Exceedances**	**% Exceedances**
DURBIN CREEK AT US HWY 1	9	27	1094	60	178	1	11.11%
DURBIN CREEK @ SWAMP TRAIL ROAD	6	4	48	28	26	0	0.00%
DURBIN CREEK AT I-95	37	20	16000	130	889	10	27.02%
DURBIN CREEK AT RACETRACK RD	56	20	4700	170	519	14	25.00%

DURBIN CREEK AT U.S. 1	50	20	3000	100	553	14	28.00%
DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	19	70	2200	230	462	8	42.10%
DURBIN CREEK AT RACETRACK ROAD	37	20	16000	130	889	10	27.02%

Coliform concentrations are counts/100 mL

Figure 5.1. Historical Sample Sites in Durbin Creek Watershed

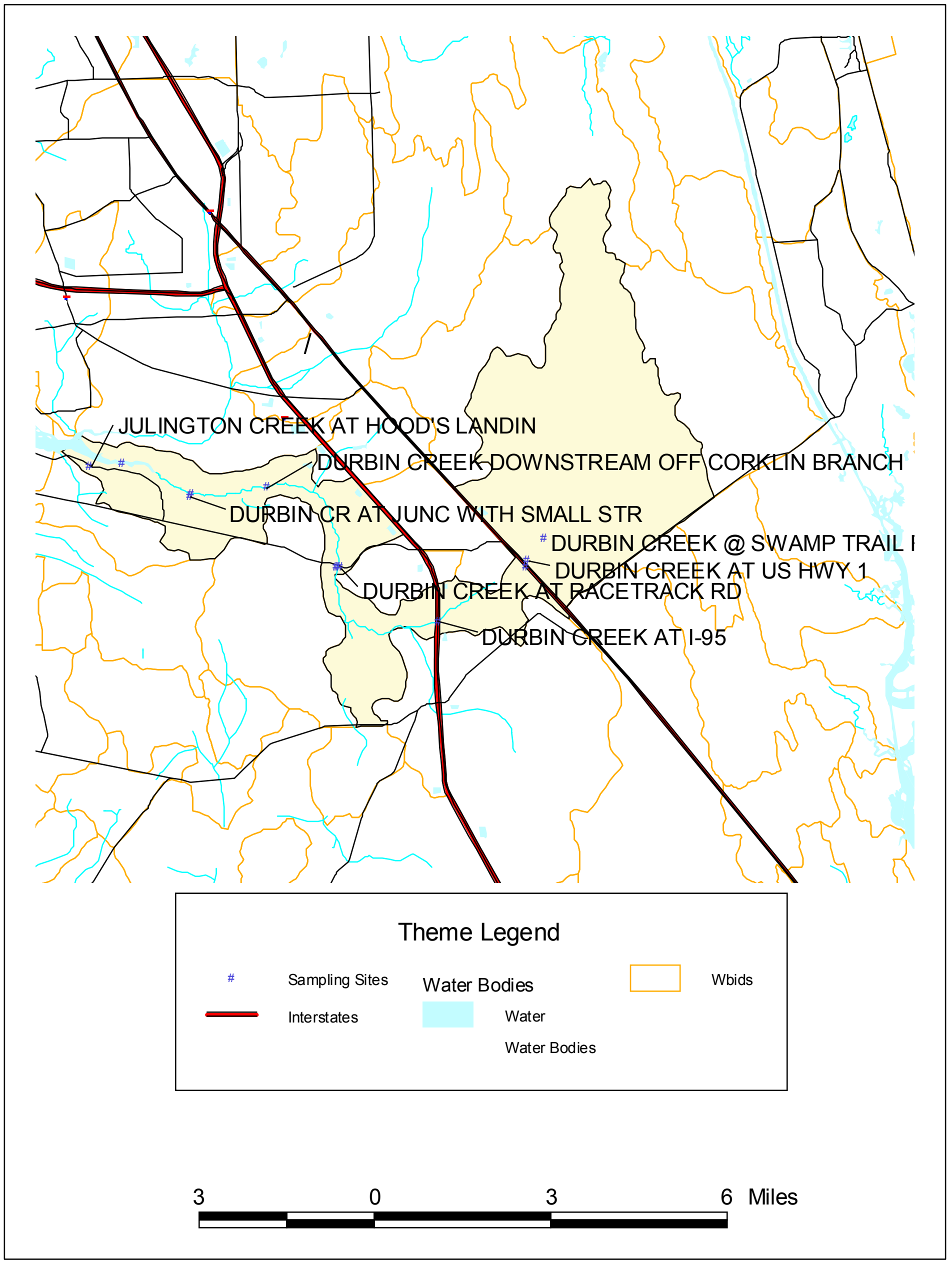
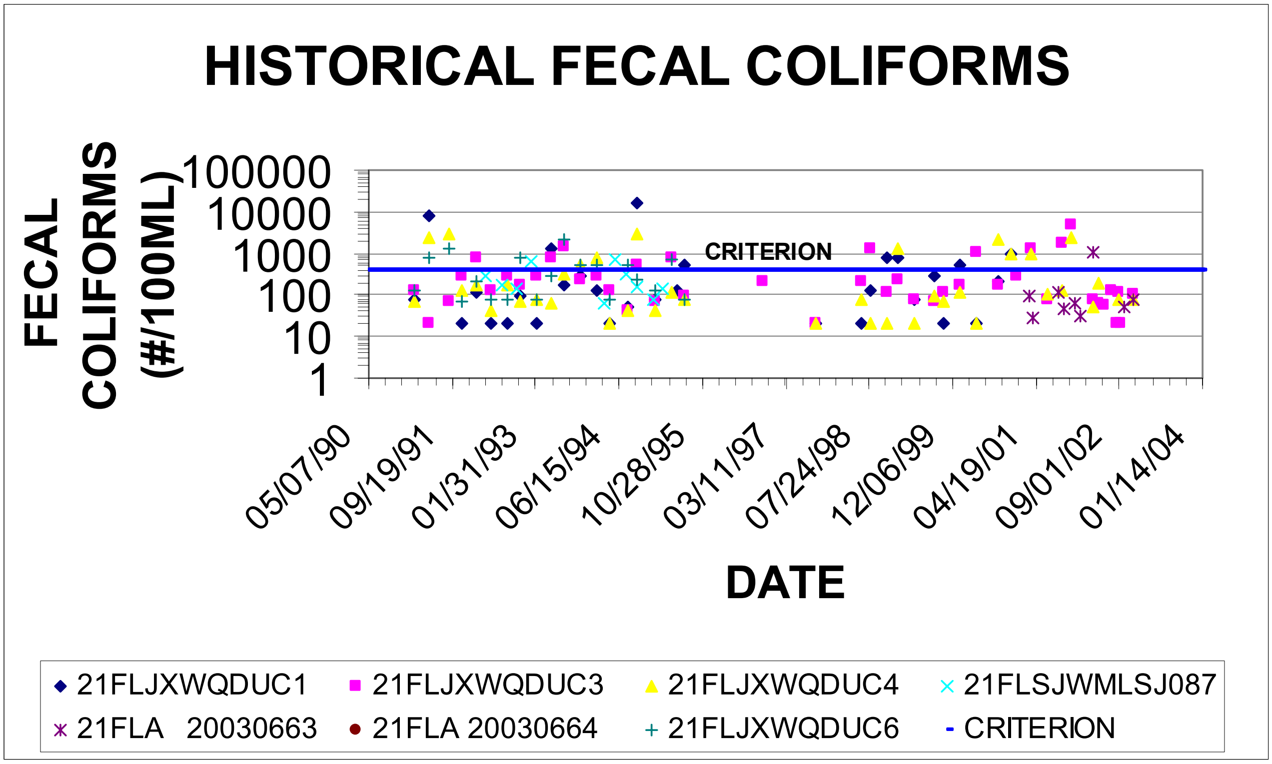


Figure 5.2. Fecal Coliform Historical Observations for Durbin Creek, WBID 2365



5.1.2 TMDL Development Process

Due to the lack of supporting information flow data, a simple reduction calculation was performed to determine the needed reduction. Exceedances of the state criterion were compared to the criterion. For each individual exceedance, an individual required reduction was calculated using the following:

$$\frac{[(\text{observed value}) - (\text{state criterion})] \times 100}{(\text{observed value})}$$

After the individual results were calculated, the median of the individual values was calculated. **Table 5.3** shows the individual reduction calculations for fecal coliforms. The median reduction was 63.3 percent

Table 5.3. Calculation of Fecal Coliform Reductions for the TMDL for Durbin Creek, WBID 2365

Sample Date	Location	Observed Value (Exceedance)	Required Reduction
5/7/1991	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	800	50.00
5/7/1991	DURBIN CREEK AT U.S. 1	2,300	82.61
5/7/1991	DURBIN CREEK AT I-95	8,000	95.00
9/3/1991	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	1,300	69.23
9/3/1991	DURBIN CREEK AT U.S. 1	3,000	86.67
2/10/1992	DURBIN CREEK AT RACETRACK RD	800	50.00
10/26/1992	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	800	50.00
1/4/1993	Durbin Creek at Racetrack Road	618	35.28
5/4/1993	DURBIN CREEK AT RACETRACK RD	800	50.00
5/4/1993	DURBIN CREEK AT I-95	1,300	69.23
7/19/1993	DURBIN CREEK AT RACETRACK RD	1,400	71.43
7/19/1993	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	2,200	81.82
10/27/1993	DURBIN CREEK AT U.S. 1	500	20.00
10/27/1993	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	500	20.00
2/2/1994	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	500	20.00
2/2/1994	DURBIN CREEK AT U.S. 1	800	50.00
5/23/1994	Durbin Creek at Racetrack Road	720	44.44
8/10/1994	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	500	20.00
10/5/1994	DURBIN CREEK AT RACETRACK RD	500	20.00
10/5/1994	DURBIN CREEK AT U.S. 1	3,000	86.67
10/5/1994	DURBIN CREEK AT I-95	16,000	97.50
5/2/1995	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	700	42.86
5/2/1995	DURBIN CREEK AT RACETRACK RD	800	50.00
7/10/1995	DURBIN CREEK AT I-95	500	20.00
7/28/1998	DURBIN CREEK AT RACETRACK RD	1,300	69.23
11/4/1998	DURBIN CREEK AT I-95	800	50.00
1/12/1999	DURBIN CREEK AT I-95	800	50.00
1/12/1999	DURBIN CREEK AT I-95	800	50.00
1/12/1999	DURBIN CREEK AT U.S. 1	1,300	69.23
1/12/1999	DURBIN CREEK AT U.S. 1	1,300	69.23
1/19/2000	DURBIN CREEK AT I-95	500	20.00
1/19/2000	DURBIN CREEK AT I-95	500	20.00
4/24/2000	DURBIN CREEK AT RACETRACK RD	1,100	63.64
4/24/2000	DURBIN CREEK AT RACETRACK RD	1,100	63.64
9/5/2000	DURBIN CREEK AT U.S. 1	2,200	81.82
9/5/2000	DURBIN CREEK AT U.S. 1	2,200	81.82
11/16/2000	DURBIN CREEK AT I-95	1,000	60.00
11/16/2000	DURBIN CREEK AT U.S. 1	1,000	60.00
3/21/2001	DURBIN CREEK AT U.S. 1	1,000	60.00
3/21/2001	DURBIN CREEK AT U.S. 1	1,000	60.00

Sample Date	Location	Observed Value (Exceedance)	Required Reduction
3/21/2001	DURBIN CREEK AT RACETRACK RD	1,300	69.23
3/21/2001	DURBIN CREEK AT RACETRACK RD	1,300	69.23
9/25/2001	DURBIN CREEK AT RACETRACK RD	1,700	76.47
9/25/2001	DURBIN CREEK AT RACETRACK RD	1,700	76.47
11/14/2001	DURBIN CREEK AT U.S. 1	2,500	84.00
11/14/2001	DURBIN CREEK AT U.S. 1	2,500	84.00
11/14/2001	DURBIN CREEK AT RACETRACK RD	4,700	91.49
11/14/2001	DURBIN CREEK AT RACETRACK RD	4,700	91.49
4/3/2002	DURBIN CREEK AT US HWY 1	1,094	63.44
	MEDIAN:	**1,094**	**63.44%**

5.2.3 Critical Conditions/Seasonality

Exceedances in Durbin Creek cannot be associated with flows, as no flow data within the basin has been reported. Therefore, the effects of flow under various conditions cannot be determined or be considered as a critical condition.

A Kruskall – Wallace analysis indicated that there were significant differences among months fecal coliforms. Linear regressions between fecal coliforms and rainfall on the cumulative three day total, cumulative seven day total, and for the month were significant, the r^2 values was low. Fecal coliform exceedances occurred in every season and nearly every year. Plots of fecal coliforms by station and season can be found in **Appendix G.** A detailed discussion of fecal coliform exceedances related to season and rainfall can be found in section 2.2.

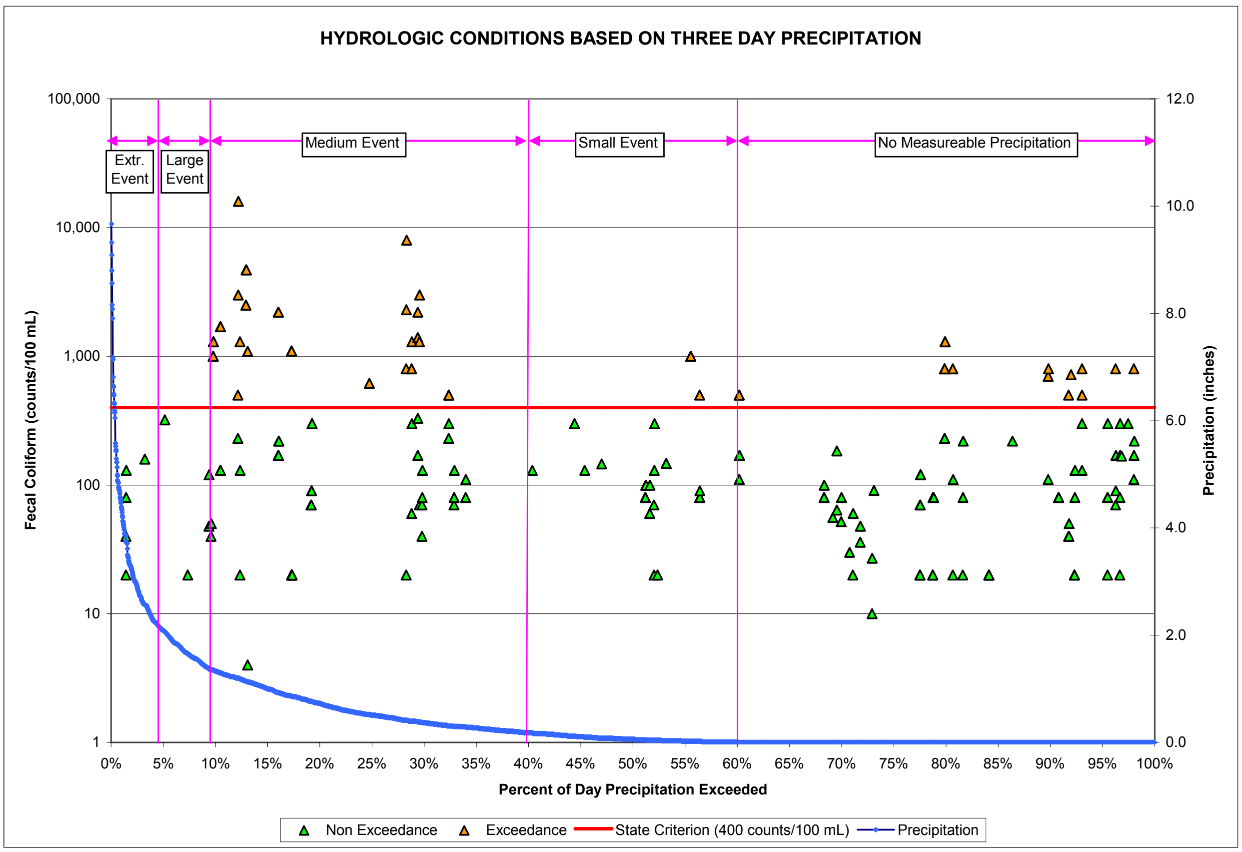
Hydrologic conditions were analyzed using rainfall, since no flow data was available. A loading curve type chart was created using precipitation data from JIA from 1990 – 2004. The chart was divided in the same manner as if flow was being analyzed, where extreme precipitation events represent the upper percentiles (0-5th percentile), followed by large precipitation events (5th – 15th percentile), medium precipitation events (15th – 40th percentile), small precipitation events (40th – 60th percentile), and no recordable precipitation events (60th – 100th percentile). Three day (day of and two days prior) precipitation accumulations were used in the analysis.

Data show that fecal coliform exceedances occurred over all hydrologic conditions except for the extreme rainfall event. The greatest number of exceedances occurred in the large rainfall events (55.5 percent) followed by the medium rainfall events (34.0 percent) Even in the no measureable rainfall event portion of the curve approximately 21 percent of the observations exceeded the 400 counts/100 mL criteria. This may indicate influences from septic tank and sewage line leakage as well as wildlife contributions that have not been quantified. Even without rain, discharge may still be finding its way to the creek. **Table 5.4** is a summary of data and hydrologic conditions for fecal coliforms, and **Figure 5.4** shows the same data visually.

Table 5.5. Summary of Coliform Data by Hydrologic Condition

Precipitation Event	Event Range	Total Values	Number of Exceedances	Percent Exceedance	Number of Non-Excedances	Percent Non-Exceedance
Extreme	>2.1"	5	0	0.00%	5	100.00%
Large	1.33" - 2.1"	27	15	55.56%	12	44.44%
Medium	0.18" - 1.33"	47	16	34.04%	31	65.96%
Small	0.01" - 0.18"	28	5	17.86%	23	82.14%
None/Not Measurable	<0.01"	89	19	21.35%	70	78.65%

Figure 5.4. Fecal Coliform Data by Hydrologic Condition



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 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 Durbin Creek are expressed in terms of counts per 100 mL and percent reduction, and represent the maximum daily fecal coliform load the creek can assimilate and maintain the coliform criterion **(Table 6.1).**

Table 6.1. TMDL Components for Durbin Creek

WBID	Parameter	TMDL (colonies/100 mL)	WLA		LA (Percent Reduction)	MOS
			Wastewater (colonies/day)	NPDES Stormwater		
2365	Fecal Coliform	400	NA	63%	63%	Implicit

6.2 Load Allocation (LA)

Fecal coliform reductions of 63 percent is required from nonpoint sources. It should be noted that the load allocation includes loading from stormwater discharges that are not part of the NPDES Stormwater Program.

6.3 Wasteload Allocation (WLA)

6.3.1 NPDES Wastewater Discharges

As mentioned previously, there are no permitted wastewater facilities with a discharge permit in the Durbin Creek Watershed. Any new potential dischargerswould be expected to comply with the Class III criteria for coliform bacteria.

6.3.2 NPDES Stormwater Discharges

As noted earlier, the City of Jacksonville and the Florida Department of Transportation (FDOT) District 2 are co-permittees in Phase I MS4 permit (permit FL000012). A small portion of the Durbin Creek watershed falls under this permit. The remainder of the Durbin Creek watershed that is in St. Johns County would fall under the Phase II St. Johns County NPDES MS4 (permit FLR04E025).

The WLA for stormwater discharges with a Municipal Separate Storm Sewer System (MS4) permit is a 63 percent reduction in current anthropogenic fecal coliform loading from the MS4. It should be noted that any MS4 permittee will only be responsible for reducing the loads associated with stormwater outfalls for which it owns or otherwise has responsible control, and is not responsible for reducing other non-point source loads within its jurisdiction.

6.4 Margin of Safety (MOS)

Consistent with the recommendations of the Allocation Technical Advisory Committee (FDEP, February 2001), an implicit margin of safety (MOS) was used in the development of this TMDL. A MOS was included 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. Additionally, the TMDL calculated for fecal coliforms was based on meeting the water quality criterion of 400 counts/100 mL without any exceedances, while the actual criterion allows for 10 percent exceedances over the criterion.

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 Durbin Creek. 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.

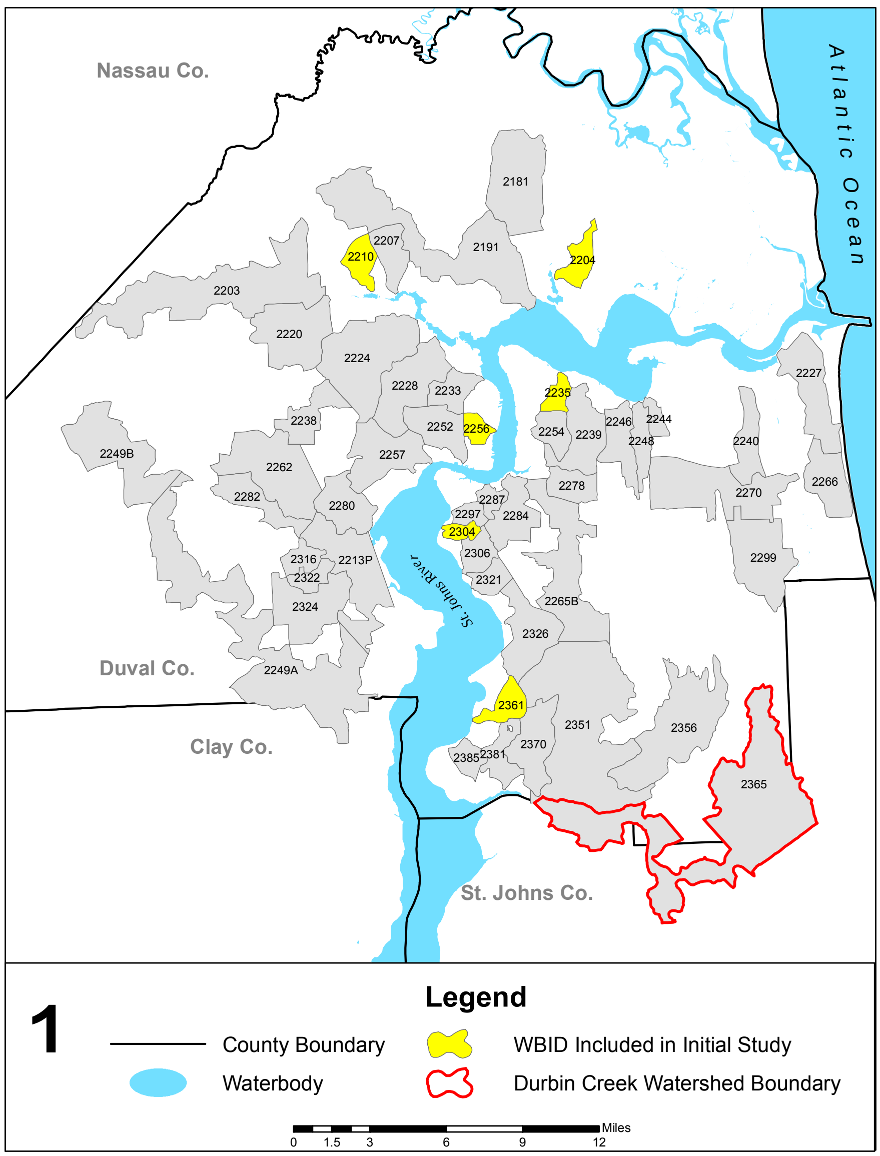
The BMAP for Durbin Creek will include the results of a project funded by JEA that will consider 51 drainage basins in the general area of the City of Jacksonville, which includes Durbin Creek. The project, known as the Tributary Pollution Assessment Project (TPAP), is directed by a Tributary Assessment Team (TAT) consisting of representatives from JEA, the Department, City of Jacksonville, Duval County Health Department, Water and Sewer Expansion Authority, U.S. Army Corps of Engineers, St. Johns River Keepers, and PBS & J, who is the primary contractor for the project.

The goal of the TPAP is to devise a standard manual that can be used for tributary sanitary surveys in the Duval County area. The manual will be developed by studying 6 of the 51 watersheds deemed to be of the highest priority by JEA and the contractors, along with a control watershed. After the manual has been developed, it will be applied to the remaining 45 watersheds, and may then be expanded to other watersheds in the Duval County area. The manual will be used to help better determine the health of these watersheds and to determine potential sources of contamination, especially with respect to fecal coliforms. This will help JEA, who is the sewer utility provider in the area, concentrate repair efforts and to identify those areas where failing septic tanks may be playing a role in contamination. The drainage basins included in this initial study are shown in **Figure 7.1**, and include:

- Big Davis Creek (2356)
- Big Fishwier Creek (2280)
- Blockhouse Creek (2207)
- Broward River (2191)
- Butcher Pen Cr. (2322)
- Durbin Creek (2262)
- Christopher Branch (2321)
- Cormorant Branch (2381)

- Cow Head Creek (2244)
- Craig Creek (2297)
- Deep Bottom Creek (2361)
- Deer Creek (2256)
- Dunn Creek (2181)
- Durbin Creek (2365)
- Fishing Creek (2324)
- Gin House Creek (2248)
- Goodbys (2326)
- Greenfield Creek (2240)
- Hogan Creek (2252)
- Hogpen Creek (2270)
- Hopkins Creek (2266)
- Jones Creek (2246)
- Julington Creek (2351)
- Little Potsburg Creek (2284)
- Little Sixmile Creek (2238)
- Long Branch (2233)
- Mandarin Drain (2385)
- McCoy Creek (2257)
- McGirts Creek (2249B)
- Miller Creek (2287)
- Miramar Creek (2304)
- Moncrief Creek (2228)
- New Castle Creek (2235)
- New Rose Creek (2306)
- Nine Mile Creek (2220)
- Oldfield Creek (2370)
- Open Creek (2299)
- Ortega River (2213P)
- Ortega River (2249A)
- Potsburg Creek (2265B)
- Red Bay Branch (2254)
- Ribault River (2224)
- Sherman Creek (2227)
- Silversmith Creek (2278)
- Sixmile Reach (2232)
- Strawberry Creek (2239)
- Terrapin Creek (2204)
- Trout River (2203)
- West Branch (2210)
- Williamson Creek (2316)
- Wills Branch (2282)

Figure 7.1. Map of WBIDs Included in the TPAP Study



The WBIDs included in this study have been categorized based on the primary land use (SJRWMD 2000 data) in the WBID – urban, suburban, or rural. Further efforts were made to identify potential sources of fecal coliform contamination based on land uses, JEA information, and survey data. The WBIDs were then prioritized based on this, as well as existing data. Six WBIDs of highest concern were selected for the initial study (3 urban, 2 suburban, and 1 rural). At the time this document was compiled, a control waterbody had yet to be selected.

Initial sampling for the study is set to begin on the six initial WBIDs on July 26, 2005 and end on February 1, 2006. The final deliverable (manual) will be submitted to JEA on June 1, 2006, and will be available for public review and comment on June 16, 2006. Four types of fecal indicators (fecal coliforms, *E. coli*., *Enterococci*, and coliphages) will be studied. *Enterococcus faecalis* will be studied in an attempt to further identify potential sources of sewage, and samples will be checked for human/ruminant primers. In addition, optical brighteners (using fluorometric techniques) will be included to bolster potential sewage sources input identification.

The executive summary submitted to the Department by JEA and PBS & J is attached as **Appendix N**. It is expected that the results of this study will be used to help identify restoration activities during BMAP development. In addition to addressing failing septic tanks, BMAP plans may include some sort of public education in picking up after dogs. As **Table 4.7** shows, potential impacts from dogs could be significant. If pet owners are educated on the potential impacts their pets are having on Durbin Creek, and they are inclined to take action, this could potentially decrease a source load. When considering the significance of the seven day rainfall, this could be a potentially significant load to the stream.

Again, considering the significance of the rainfall to exceedances, a closer look at current stormwater management practices may be warranted. This is further supported when considering the highest concentrations of coliforms are, by far, found in the summer months when precipitation can occur nearly every day, with occasional significant amounts of rainfall. The BMAP for Durbin Creek may include improved stormwater management.

References

American Veterinary Medical Association Website, 2005. Available at http://www.avma.org/membshp/marketstats/formulas.asp

Florida Administrative Code. Chapter 62-302, Surface Water Quality Standards.

Florida Administrative Code. Chapter 62-303, Identification of Impaired Surface Waters.

Florida Department of Environmental Protection. February 2001. *A Report to the Governor and the Legislature on the Allocation of Total Maximum Daily Loads in Florida.* Tallahassee, Florida: Bureau of Watershed Management.

Florida Department of Environmental Protection. March 2003. Lower St. Johns Basin Status Report. Tallahassee, Florida. Available at http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

Florida Department of Environmental Protection. 2001. Ocklawaha Basin Status Report. Tallahassee, Florida. Available at http://www.dep.state.fl.us/water/tmdl/stat_rep.htm.

Florida Department of Health Web site. 2005. Available at http://www.doh.state.fl.us/.

Florida Department of Health Web site. 2005. Available at http://www.doh.state.fl.us/environment/OSTDS/statistics/NewInstallations.htm

Florida Department of Health Web site. 2005. Available at http://doh.state.fl.us/environment/ostds/statistics/repairs.htm

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

U. S. Census Bureau. 2005. Available at http://www.census.gov/.

U.S. Environmental Protection Agency, 2001. Protocols for Developing Pathogen TMDLs, First Edition. Office of Water, Washington, D.C. EPA 841-R-00-002.

Appendices

Appendix A: Historical Fecal Coliform Data for Durbin Creek

WATERBODY	WBID	SAMPLE DATE	STATION	LOCATION	VALUE (#/100mL)	REMARK CODE
Durbin Creek	2365	2/5/1991	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	130	
Durbin Creek	2365	2/6/1991	21FLJXWQDUC1	DURBIN CREEK AT I-95	80	
Durbin Creek	2365	2/6/1991	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	130	
Durbin Creek	2365	2/6/1991	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	70	
Durbin Creek	2365	5/7/1991	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	800	
Durbin Creek	2365	5/7/1991	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	2,300	
Durbin Creek	2365	5/7/1991	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	20	K
Durbin Creek	2365	5/7/1991	21FLJXWQDUC1	DURBIN CREEK AT I-95	8,000	
Durbin Creek	2365	9/3/1991	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	3,000	
Durbin Creek	2365	9/3/1991	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	1,300	
Durbin Creek	2365	9/3/1991	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	70	
Durbin Creek	2365	11/18/1991	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	130	
Durbin Creek	2365	11/18/1991	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	300	
Durbin Creek	2365	11/18/1991	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	70	
Durbin Creek	2365	11/18/1991	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	K
Durbin Creek	2365	2/10/1992	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	800	
Durbin Creek	2365	2/10/1992	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	220	
Durbin Creek	2365	2/10/1992	21FLJXWQDUC1	DURBIN CREEK AT I-95	110	
Durbin Creek	2365	2/10/1992	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	170	
Durbin Creek	2365	4/7/1992	21FLSJWMLSJ087	DURBIN CREEK AT RACETRACK RD	300	
Durbin Creek	2365	5/13/1992	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	80	
Durbin Creek	2365	5/13/1992	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	K
Durbin Creek	2365	5/13/1992	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	40	
Durbin Creek	2365	5/13/1992	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	130	
Durbin Creek	2365	7/13/1992	21FLSJWMLSJ087	DURBIN CREEK AT RACETRACK RD	168	B
Durbin Creek	2365	8/11/1992	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	K
Durbin Creek	2365	8/11/1992	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	300	
Durbin Creek	2365	8/11/1992	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	80	
Durbin Creek	2365	8/11/1992	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	170	
Durbin Creek	2365	10/12/1992	21FLSJWMLSJ087	DURBIN CREEK AT RACETRACK RD	146	
Durbin Creek	2365	10/26/1992	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	170	
Durbin Creek	2365	10/26/1992	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	70	
Durbin Creek	2365	10/26/1992	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	800	
Durbin Creek	2365	10/26/1992	21FLJXWQDUC1	DURBIN CREEK AT I-95	90	
Durbin Creek	2365	1/4/1993	21FLSJWMLSJ087	DURBIN CREEK AT RACETRACK RD	618	B
Durbin Creek	2365	2/2/1993	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	300	
Durbin Creek	2365	2/2/1993	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	80	
Durbin Creek	2365	2/2/1993	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	80	
Durbin Creek	2365	2/2/1993	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	
Durbin Creek	2365	5/4/1993	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	60	
Durbin Creek	2365	5/4/1993	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	800	
Durbin Creek	2365	5/4/1993	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	300	
Durbin Creek	2365	5/4/1993	21FLJXWQDUC1	DURBIN CREEK AT I-95	1,300	
Durbin Creek	2365	7/19/1993	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,400	
Durbin Creek	2365	7/19/1993	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	330	

WATERBODY	WBID	SAMPLE DATE	STATION	LOCATION	VALUE (#/100mL)	REMARK CODE
Durbin Creek	2365	7/19/1993	21FLJXWQDUC1	DURBIN CREEK AT I-95	170	
Durbin Creek	2365	7/19/1993	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	2,200	
Durbin Creek	2365	10/27/1993	21FLJXWQDUC1	DURBIN CREEK AT I-95	300	
Durbin Creek	2365	10/27/1993	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	500	
Durbin Creek	2365	10/27/1993	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	230	
Durbin Creek	2365	10/27/1993	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	500	
Durbin Creek	2365	2/2/1994	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	300	
Durbin Creek	2365	2/2/1994	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	800	
Durbin Creek	2365	2/2/1994	21FLJXWQDUC1	DURBIN CREEK AT I-95	130	
Durbin Creek	2365	2/2/1994	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	500	
Durbin Creek	2365	3/21/1994	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	60	
Durbin Creek	2365	3/21/1994	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	100	
Durbin Creek	2365	4/20/1994	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	80	
Durbin Creek	2365	4/20/1994	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	K
Durbin Creek	2365	4/20/1994	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	130	
Durbin Creek	2365	4/20/1994	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	K
Durbin Creek	2365	5/23/1994	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	720	
Durbin Creek	2365	7/28/1994	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	320	
Durbin Creek	2365	8/10/1994	21FLJXWQDUC1	DURBIN CREEK AT I-95	50	
Durbin Creek	2365	8/10/1994	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	40	
Durbin Creek	2365	8/10/1994	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	40	
Durbin Creek	2365	8/10/1994	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	500	
Durbin Creek	2365	10/3/1994	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	159	
Durbin Creek	2365	10/5/1994	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	230	
Durbin Creek	2365	10/5/1994	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	3,000	
Durbin Creek	2365	10/5/1994	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	500	
Durbin Creek	2365	10/5/1994	21FLJXWQDUC1	DURBIN CREEK AT I-95	16,000	
Durbin Creek	2365	1/10/1995	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	80	Q
Durbin Creek	2365	1/10/1995	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	80	
Durbin Creek	2365	1/17/1995	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	130	
Durbin Creek	2365	1/17/1995	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	40	
Durbin Creek	2365	1/17/1995	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	70	
Durbin Creek	2365	1/17/1995	21FLJXWQDUC1	DURBIN CREEK AT I-95	80	
Durbin Creek	2365	3/1/1995	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	147	Q
Durbin Creek	2365	3/1/1995	21FLSJWMLSJ087	Durbin Creek at Racetrack Road	147	
Durbin Creek	2365	5/2/1995	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	110	
Durbin Creek	2365	5/2/1995	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	800	
Durbin Creek	2365	5/2/1995	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	700	
Durbin Creek	2365	5/25/1995	21FLJXWQDUC1	DURBIN CREEK AT I-95	130	
Durbin Creek	2365	7/10/1995	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	90	
Durbin Creek	2365	7/10/1995	21FLJXWQDUC1	DURBIN CREEK AT I-95	500	
Durbin Creek	2365	7/10/1995	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	80	
Durbin Creek	2365	7/10/1995	21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH	80	
Durbin Creek	2365	10/28/1996	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	220	
Durbin Creek	2365	9/8/1997	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	K
Durbin Creek	2365	9/8/1997	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	
Durbin Creek	2365	9/8/1997	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	20	
Durbin Creek	2365	6/9/1998	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	220	
Durbin Creek	2365	6/9/1998	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	80	
Durbin Creek	2365	6/9/1998	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	K
Durbin Creek	2365	7/28/1998	21FLJXWQDUC1	DURBIN CREEK AT I-95	130	
Durbin Creek	2365	7/28/1998	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	
Durbin Creek	2365	7/28/1998	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,300	
Durbin Creek	2365	11/4/1998	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	
Durbin Creek	2365	11/4/1998	21FLJXWQDUC1	DURBIN CREEK AT I-95	800	
Durbin Creek	2365	11/4/1998	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	110	

WATERBODY	WBID	SAMPLE DATE	STATION	LOCATION	VALUE (#/100mL)	REMARK CODE
Durbin Creek	2365	1/12/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	800	
Durbin Creek	2365	1/12/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	230	
Durbin Creek	2365	1/12/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	1,300	
Durbin Creek	2365	1/12/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	800	
Durbin Creek	2365	1/12/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	1,300	
Durbin Creek	2365	1/12/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	230	
Durbin Creek	2365	4/20/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	80	
Durbin Creek	2365	4/20/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	80	
Durbin Creek	2365	4/20/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	80	
Durbin Creek	2365	4/20/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	80	
Durbin Creek	2365	4/20/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	K
Durbin Creek	2365	4/20/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	U
Durbin Creek	2365	8/17/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	90	
Durbin Creek	2365	8/17/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	300	
Durbin Creek	2365	8/17/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	90	
Durbin Creek	2365	8/17/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	300	
Durbin Creek	2365	8/17/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	70	
Durbin Creek	2365	8/17/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	70	
Durbin Creek	2365	10/12/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	U
Durbin Creek	2365	10/12/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	70	
Durbin Creek	2365	10/12/1999	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	70	
Durbin Creek	2365	10/12/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	120	
Durbin Creek	2365	10/12/1999	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	120	
Durbin Creek	2365	10/12/1999	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	K
Durbin Creek	2365	1/19/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	170	
Durbin Creek	2365	1/19/2000	21FLJXWQDUC1	DURBIN CREEK AT I-95	500	
Durbin Creek	2365	1/19/2000	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	110	
Durbin Creek	2365	1/19/2000	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	110	
Durbin Creek	2365	1/19/2000	21FLJXWQDUC1	DURBIN CREEK AT I-95	500	
Durbin Creek	2365	1/19/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	170	
Durbin Creek	2365	4/24/2000	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	
Durbin Creek	2365	4/24/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,100	
Durbin Creek	2365	4/24/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,100	
Durbin Creek	2365	4/24/2000	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	K
Durbin Creek	2365	4/24/2000	21FLJXWQDUC1	DURBIN CREEK AT I-95	20	U
Durbin Creek	2365	4/24/2000	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	20	U
Durbin Creek	2365	9/5/2000	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	2,200	
Durbin Creek	2365	9/5/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	170	
Durbin Creek	2365	9/5/2000	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	2,200	
Durbin Creek	2365	9/5/2000	21FLJXWQDUC1	DURBIN CREEK AT I-95	220	
Durbin Creek	2365	9/5/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	170	
Durbin Creek	2365	9/5/2000	21FLJXWQDUC1	DURBIN CREEK AT I-95	220	
Durbin Creek	2365	11/16/2000	21FLJXWQDUC1	DURBIN CREEK AT I-95	1,000	
Durbin Creek	2365	11/16/2000	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	1,000	
Durbin Creek	2365	12/19/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	300	
Durbin Creek	2365	12/19/2000	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	300	
Durbin Creek	2365	3/7/2001	21FLA 20030663	DURBIN CREEK AT US HWY 1	91	
Durbin Creek	2365	3/21/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	1,000	
Durbin Creek	2365	3/21/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	1,000	
Durbin Creek	2365	3/21/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,300	
Durbin Creek	2365	3/21/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,300	
Durbin Creek	2365	4/5/2001	21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD	10	
Durbin Creek	2365	4/5/2001	21FLA 20030663	DURBIN CREEK AT US HWY 1	27	
Durbin Creek	2365	6/27/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	80	F
Durbin Creek	2365	6/27/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	100	F
Durbin Creek	2365	6/27/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	100	

WATERBODY	WBID	SAMPLE DATE	STATION	LOCATION	VALUE (#/100mL)	REMARK CODE
Durbin Creek	2365	6/27/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	80	
Durbin Creek	2365	9/6/2001	21FLA 20030663	DURBIN CREEK AT US HWY 1	120	
Durbin Creek	2365	9/6/2001	21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD	48	
Durbin Creek	2365	9/25/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,700	
Durbin Creek	2365	9/25/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	1,700	
Durbin Creek	2365	9/25/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	130	
Durbin Creek	2365	9/25/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	130	
Durbin Creek	2365	10/4/2001	21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD	36	
Durbin Creek	2365	10/4/2001	21FLA 20030663	DURBIN CREEK AT US HWY 1	48	
Durbin Creek	2365	11/14/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	2,500	
Durbin Creek	2365	11/14/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	4,700	
Durbin Creek	2365	11/14/2001	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	4,700	
Durbin Creek	2365	11/14/2001	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	2,500	
Durbin Creek	2365	12/4/2001	21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD	20	
Durbin Creek	2365	12/4/2001	21FLA 20030663	DURBIN CREEK AT US HWY 1	60	
Durbin Creek	2365	1/9/2002	21FLA 20030663	DURBIN CREEK AT US HWY 1	30	
Durbin Creek	2365	3/25/2002	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	52	
Durbin Creek	2365	3/25/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	80	
Durbin Creek	2365	4/3/2002	21FLA 20030663	DURBIN CREEK AT US HWY 1	1,094	
Durbin Creek	2365	4/3/2002	21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD	4	
Durbin Creek	2365	5/1/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	64	
Durbin Creek	2365	5/1/2002	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	184	
Durbin Creek	2365	5/28/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	56	
Durbin Creek	2365	7/17/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	130	
Durbin Creek	2365	8/13/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	20	
Durbin Creek	2365	8/26/2002	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	80	
Durbin Creek	2365	8/26/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	110	U
Durbin Creek	2365	9/10/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	20	
Durbin Creek	2365	10/2/2002	21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD	40	
Durbin Creek	2365	10/2/2002	21FLA 20030663	DURBIN CREEK AT US HWY 1	50	
Durbin Creek	2365	11/25/2002	21FLA 20030663	DURBIN CREEK AT US HWY 1	80	
Durbin Creek	2365	11/25/2002	21FLJXWQDUC4	DURBIN CREEK AT U.S. 1	80	
Durbin Creek	2365	11/25/2002	21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD	100	

Shaded cells are values which exceed the state criterion of 400 counts/100 mL

Remark Codes: L – Off-scale high. Actual value not known, but known to be greater then value shown
B – Results based on colony counts outside the acceptable range
F –
K – Off scale low. Actual value not known, but known to less than value shown
U -

NOTE: Some samples were seen as duplicates (i.e. same date and location) and were averaged, per the IWR, for TMDL determination. Appendix B includes all data contained in the IWR database. For this reason, some discrepancies may exist between Appendix B and tables contained in the text.

Appendix B: : Kruskall – Wallis Analysis of Fecal Coliform Observations and Month in the Durbin Creek

Categorical values encountered during processing are:
MONTH (12 levels)
1, 2, 3, 4, 5, 6, 7,
8, 9, 10, 11, 12

Kruskal-Wallis One-Way Analysis of Variance for 190 cases
Dependent variable is VALUE
Grouping variable is MONTH

Group	Count	Rank Sum
1	20	2158.000
2	16	1607.000
3	11	1194.000
4	21	1203.000
5	20	2108.000
6	7	495.000
7	14	1599.000
8	17	1262.000
9	19	1979.000
10	25	2379.000
11	16	1836.500
12	4	324.500

Kruskal-Wallis Test Statistic = 20.946
Probability is 0.034 assuming Chi-square distribution with 11 df

Appendix C Kruskall – Wallis Analysis of Fecal Coliform Observations and Season in the Durbin Creek

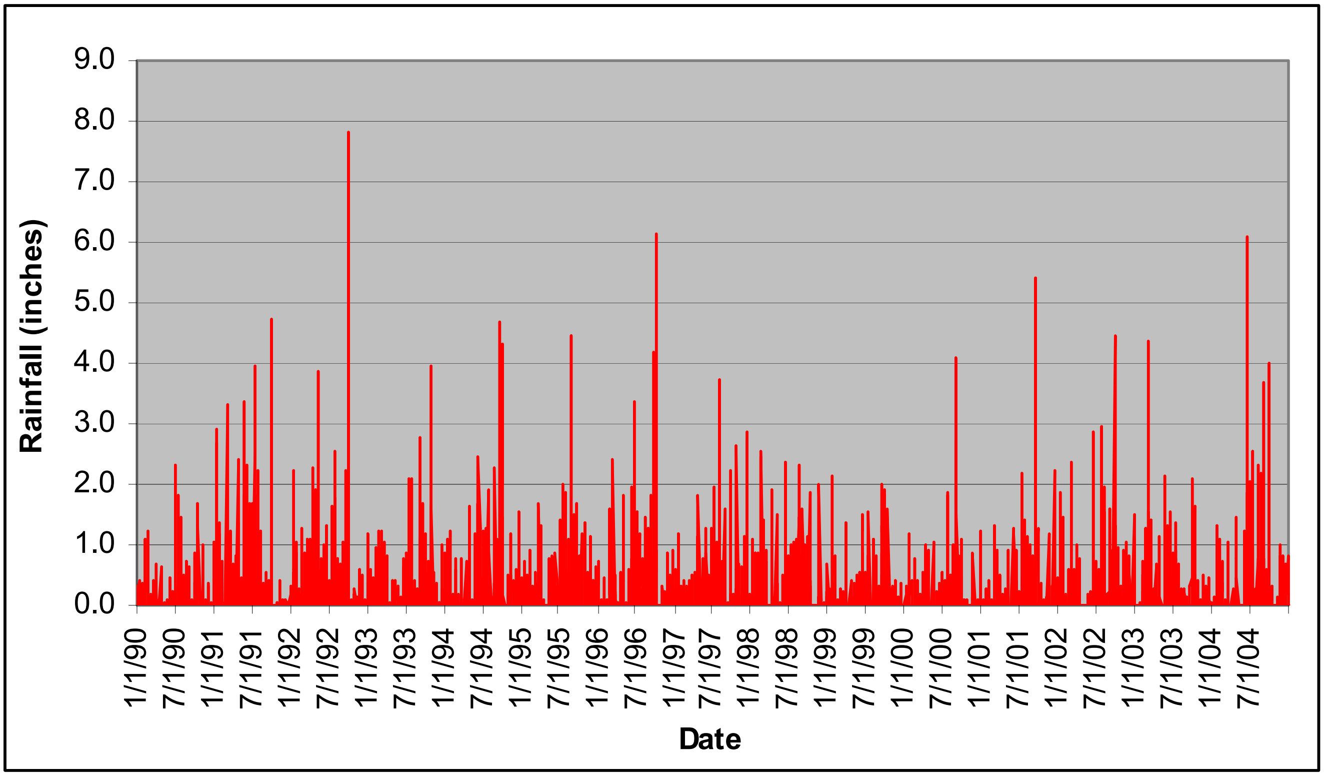
Categorical values encountered during processing are:
SEASON2 (4 levels)
1, 2, 3, 4

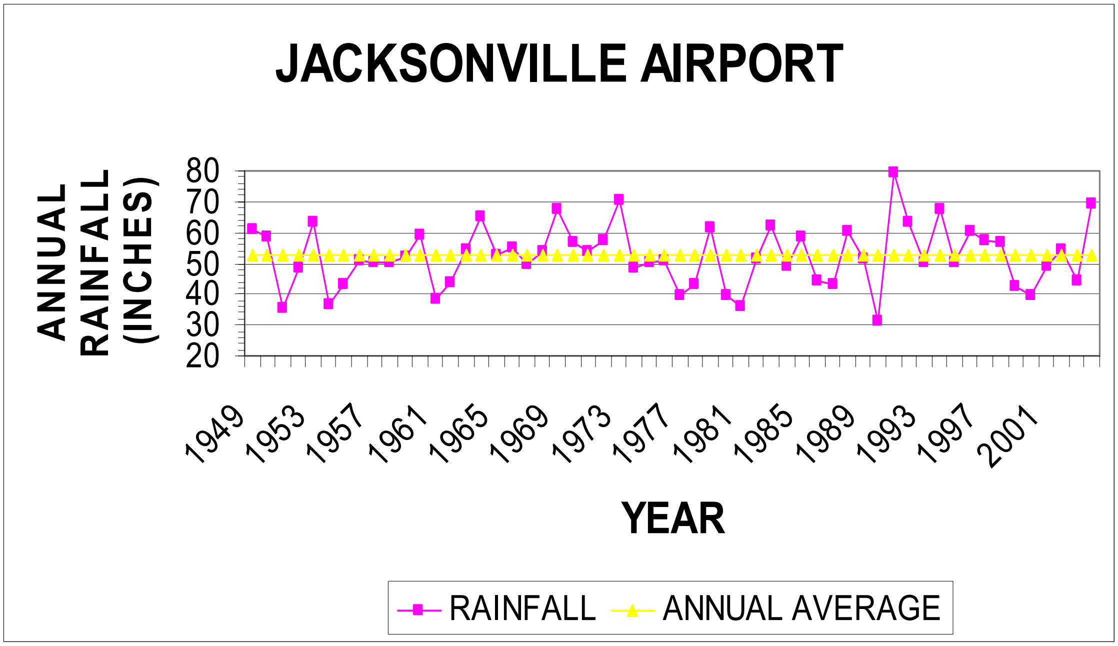
Kruskal-Wallis One-Way Analysis of Variance for 190 cases
Dependent variable is VALUE
Grouping variable is SEASON2

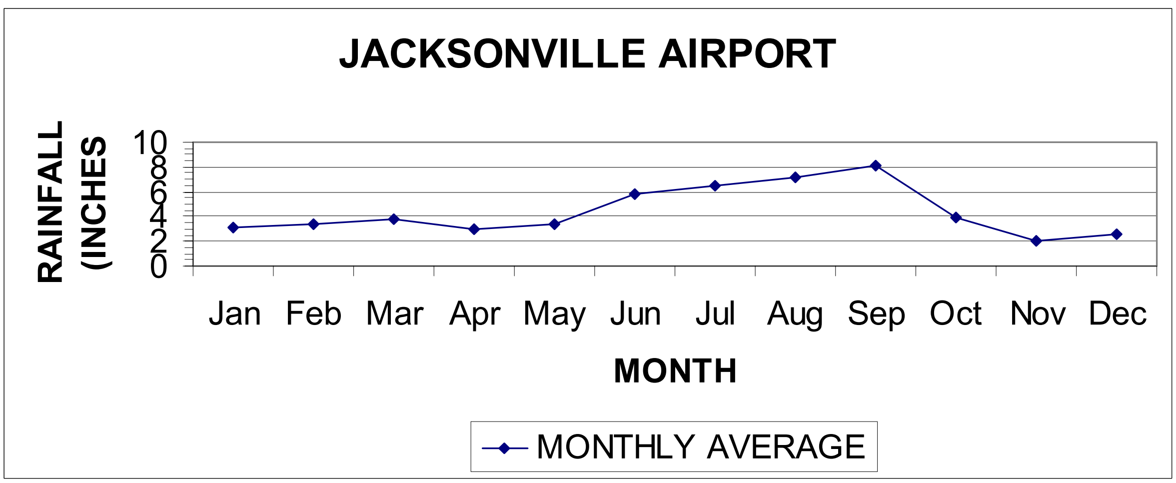
Group	Count	Rank Sum
1	47	4959.000
2	48	3806.000
3	50	4840.000
4	45	4540.000

Kruskal-Wallis Test Statistic = 6.215
Probability is 0.102 assuming Chi-square distribution with 3 df

Appendix D: Chart of Rainfall for Jacksonville International Airport (JIA) from 1990 – 2004




JACKSONVILLE AIRPORT
ANNUAL RAINFALL (INCHES)
80
70
60
50
40
30
20
1949
1953
1957
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
YEAR
RAINFALL
ANNUAL AVERAGE


JACKSONVILLE AIRPORT
RAINFALL (INCHES)
10
8
6
4
2
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
MONTH
MONTHLY AVERAGE

Appendix E: Spearman Correlation Matrix Analysis of Fecal Coliform Observations and Rainfall in the Durbin Creek

The following results are for:
WBID$ = 2365.000000

Spearman correlation matrix

	MONTH	DAY	VALUE	V1D_PREC	V3D_PREC
MONTH	1.000				
DAY	0.021	1.000			
VALUE	0.067	0.034	1.000		
V1D_PREC	0.168	0.042	0.096	1.000	
V3D_PREC	0.156	0.115	0.295	0.679	1.000
V7D_PRE	-0.027	0.035	0.269	0.484	0.711
MONTH_PR	0.142	0.170	0.176	0.147	0.367
SEASON2	0.972	0.036	0.037	0.136	0.134
EXCEEDANCE2	0.008	-0.005	0.766	0.068	0.281
PEREXCEED	0.048	-0.005	0.778	0.117	0.326

	V7D_PRE	MONTH_PR	SEASON2	EXCEEDANCE2	PEREXCEED
V7D_PRE	1.000				
MONTH_PR	0.495	1.000			
SEASON2	-0.057	0.128	1.000		
EXCEEDANCE2	0.234	0.059	-0.007	1.000	
PEREXCEED	0.263	0.066	0.028	0.985	1.000

Appendix F: Regression Analysis of Fecal Coliform Observations and Rainfall in the Durbin Creek

Analysis of sample day precipitation (1 day)

Dep Var: VALUE N: 190 Multiple R: 0.031 Squared multiple R: 0.001

Adjusted squared multiple R: 0.000 Standard error of estimate: 1453.337

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	526.178	112.486	0.000	.	4.678	0.000
V1D_PREC	72.321	168.570	0.031	1.000	0.429	0.668

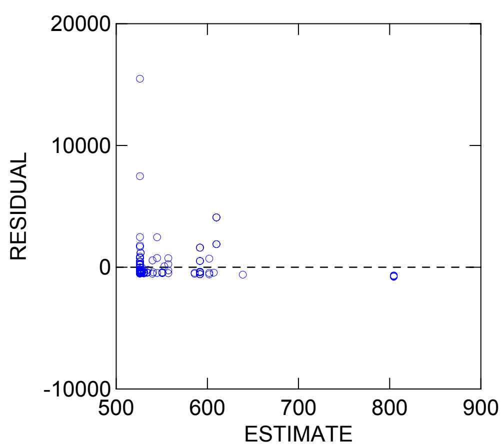
Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	388777.392	1	388777.392	0.184	0.668
Residual	3.97091E+08	188	2112187.870		

*** WARNING ***
Case 8 is an outlier (Studentized Residual = 5.552)
Case 21 has large leverage (Leverage = 0.181)
Case 22 has large leverage (Leverage = 0.181)
Case 23 has large leverage (Leverage = 0.181)
Case 24 has large leverage (Leverage = 0.181)
Case 72 is an outlier (Studentized Residual = 16.981)

Durbin-Watson D Statistic 1.730
First Order Autocorrelation 0.135

Plot of residuals against predicted values



Analysis of sample day and two days prior precipitation (3 day)

Dep Var: VALUE   N: 190   Multiple R: 0.162   Squared multiple R: 0.026

Adjusted squared multiple R: 0.021   Standard error of estimate: 1434.844

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	399.079	122.164	0.000	.	3.267	0.001
V3D_PREC	326.768	145.180	0.162	1.000	2.251	0.026

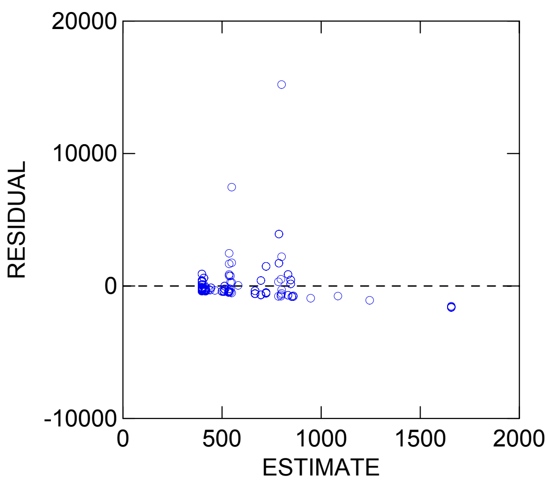
Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	1.04297E+07	1	1.04297E+07	5.066	0.026
Residual	3.87050E+08	188	2058778.558		

*** WARNING ***
Case 8 is an outlier (Studentized Residual = 5.613)
Case 21 has large leverage (Leverage = 0.124)
Case 22 has large leverage (Leverage = 0.124)
Case 23 has large leverage (Leverage = 0.124)
Case 24 has large leverage (Leverage = 0.124)
Case 72 is an outlier (Studentized Residual = 16.884)

Durbin-Watson D Statistic 1.747
First Order Autocorrelation 0.126

Plot of residuals against predicted values



Analysis of sample day and six days prior precipitation (7 day)

Dep Var: VALUE   N: 190   Multiple R: 0.199   Squared multiple R: 0.039

Adjusted squared multiple R: 0.034   Standard error of estimate: 1425.101

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	293.429	136.975	0.000	.	2.142	0.033
V7D_PRE	261.787	94.250	0.199	1.000	2.778	0.006

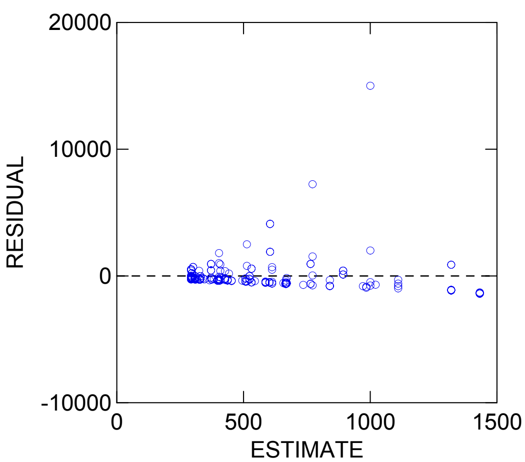
Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	1.56683E+07	1	1.56683E+07	7.715	0.006
Residual	3.81812E+08	188	2030913.622		

*** WARNING ***
Case 8 is an outlier (Studentized Residual = 5.472)
Case 72 is an outlier (Studentized Residual = 16.764)

Durbin-Watson D Statistic 1.745
First Order Autocorrelation 0.127

Plot of residuals against predicted values



Analysis of sample day and precipitation for the month (month)

Dep Var: VALUE   N: 190   Multiple R: 0.167   Squared multiple R: 0.028

Adjusted squared multiple R: 0.023   Standard error of estimate: 1433.719

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	229.948	170.501	0.000	.	1.349	0.179
MONTH_PR	64.829	27.978	0.167	1.000	2.317	0.022

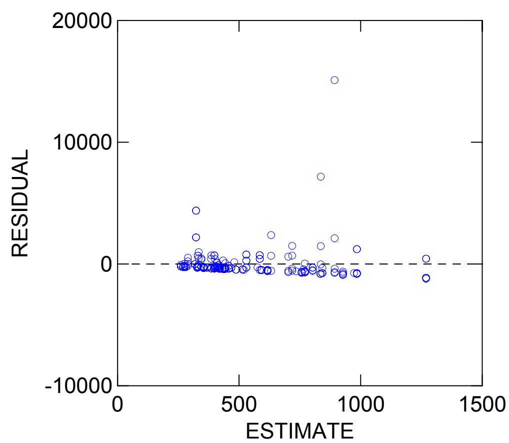
Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	1.10367E+07	1	1.10367E+07	5.369	0.022
Residual	3.86443E+08	188	2055549.843		

*** WARNING ***
Case 8 is an outlier (Studentized Residual = 5.392)
Case 72 is an outlier (Studentized Residual = 16.762)

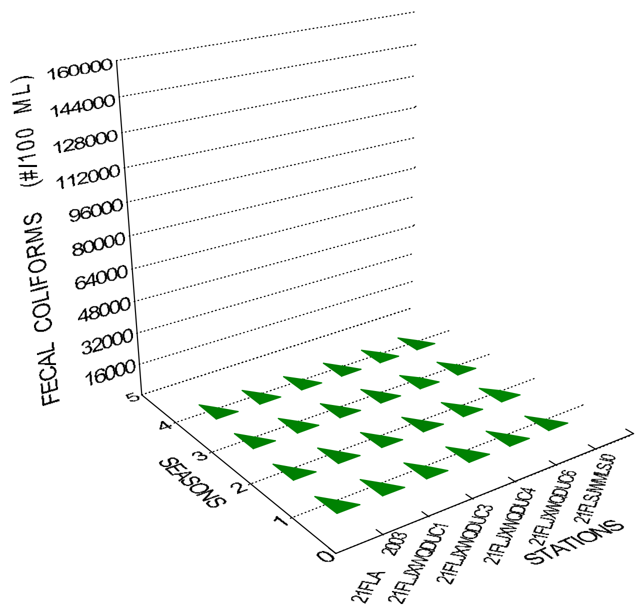
Durbin-Watson D Statistic 1.734
First Order Autocorrelation 0.133

Plot of residuals against predicted values



Appendix G: Fecal Coliform Observations by Season and Station in the Durbin Creek

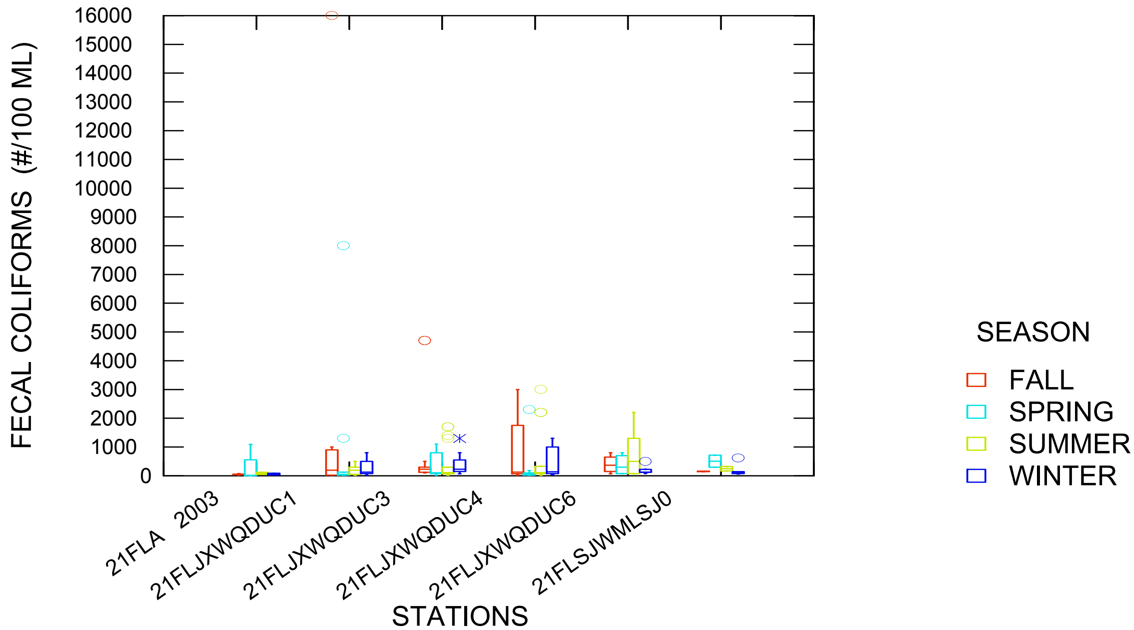
FECAL COLIFORMS BY SITE AND SEASON



PYRAMID HEIGHT BASED ON MEDIAN VALUE

STORET ID	Station
21FLA 20030663	DURBIN CREEK AT US HWY 1
21FLA 20030664	DURBIN CREEK @ SWAMP TRAIL ROAD
21FLJXWQDUC1	DURBIN CREEK AT I-95
21FLJXWQDUC3	DURBIN CREEK AT RACETRACK RD
21FLJXWQDUC4	DURBIN CREEK AT U.S. 1
21FLJXWQDUC6	DURBIN CREEK DOWNSTREAM OFF CORKLIN BRANCH
21FLSJWMLSJ087	DURBIN CREEK AT RACETRACK ROAD

FECAL COLIFORMS BY SITE AND SEASON



Appendix H: 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 I: Executive Summary of Tributary Pollution Assessment Project (TPAP)

Tributary Pollution Assessment
Executive Summary

The Tributary Pollution Assessment Project involves developing and evaluating a methodology for conducting tributary pollution assessments for listed water bodies in the Duval County area, as referenced in the Reasonable Assurance (RA) Plan. Duval County has approximately 100 tributary Water Body IDs (WBIDs), i.e. small to large tributaries of the St. Johns River, identified by the State. The RA Plan provides reasonable assurance that the fecal coliform levels of the 51 top-ranked WBIDs will be reduced sufficiently to restore them to their designated use for recreation. The 51 WBIDs are grouped into four priority groups in the RA Plan.

PBS&J was contracted by JEA to develop a methodology for conducting tributary pollution assessments for sources of fecal coliform contamination in the listed tributaries. This methodology will be field-verified by conducting sanitary surveys of selected tributary water body segments, and revised based on lessons learned from this process. The final product of this endeavor will be a *Tributary Pollution Assessment Manual* that can be used as a blueprint for conducting sanitary surveys.

The Tributary Pollution Assessment Project is a continuation of the effort started under the RA Plan. The RA Plan participants have been brought together to form the Tributary Assessment Team (TAT). The TAT will serve as an advisory committee to the PBS&J Project Team throughout the development of the *Tributary Pollution Assessment Manual*. The TAT is composed of representatives from:

- JEA
- City of Jacksonville Environmental Quality Division
- City of Jacksonville Public Works Department
- Duval County Health Department
- Florida Department of Environmental Protection
- St. Johns Riverkeeper
- Water and Sewer Expansion Authority
- US Army Corps of Engineers

Other representatives (from these and additional entities) may be included in the TAT activities in varying roles, as relevant.

Our approach for developing and evaluating a methodology for conducting tributary pollution assessments is divided into six major phases including:

1) Pre-planning;
2) Planning;
3) Development of *Tributary Pollution Assessment Manual*;
4) Evaluation of Methodology/Manual by Conducting Sanitary Surveys;
5) Summary Report; and
6) Public Workshop.

The Pre-Planning phase (Phase I) entailed four main goals:
1) to obtain and review all documents included in the RA Plan;
2) to develop categories for tributary classification and categorize the 51 priority WBIDs;
3) to overlay each WBID onto land use, infrastructure, and historical sampling maps to begin assessing probable sources and migration pathways; and

4) to develop the *Draft Work Plan*.

The Planning phase (Phase II) begins with the organization and initial meeting of the Tributary Assessment Team (TAT) with the ultimate goal of finalizing the *Work Plan*.
The Development of the *Tributary Pollution Assessment Manual* phase (Phase III) primarily involves the formulation of the assessment methodology for each tributary category described in the Pre-Planning phase, the use of a decision tree to determine which assessment methodology corresponds to each of the highest-ranked WBIDs, and the establishment of a model monitoring plan for each tributary category. This phase will be completed upon submitting the *Manual* to the TAT for review.
The next phase, Evaluation of Methodology/Manual by Conducting Sanitary Surveys (Phase IV), entails field-verification of the methodology described in the *Draft Tributary Pollution Assessment Manual* for the highest ranked water bodies for each category (or as determined to ensure adequate geographical representation of the study area) and applying the results to recommend generic corrective actions and revise the methodology, if necessary. The outcome of this phase would be the *Tributary Pollution Assessment Manual.*
The final two phases, Summary Report (Phase V) and Public Workshop (Phase VI), would entail providing a summary of the results of the tributary pollution assessments, including a discussion of lessons learned and site-specific corrective actions, to JEA and presenting the results from the *Tributary Pollution Assessment Manual* to the public. The final phase would also include a written summary of public input received at the workshop.

For additional information, please contact: Don Deis, PBS&J Project Manager, at (904) 363-8442 or drdeis@pbsj.com.

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