Louisiana Department of Health and Hospitals
Office Of Public Health
Center For Environmental Health

Louisiana BEACH Grant Report
2009 Swimming Season

Submitted to U.S. Environmental Protection Agency
In Partial Fulfillment of Federal Assistance Agreement Number CU-97606401-0, CU-976992-01 and CU-96667101-0 for Development of Coastal Recreation Water Monitoring and Public Notification

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In cooperation with Louisiana Department of Health and Hospitals
Office of Public Health, Center for Environmental Health

March 2010

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Acknowledgements

Quantitative Ecological Services, Inc. (QES) wishes to thank Gordon Leblanc, Program Administrator, Molluscan Shellfish Program, Office of Public Health, Louisiana Department of Health and Hospitals (LDHH), and Jerome Freedman, BEACH Program Coordinator, LDHH, for their invaluable guidance and assistance during preparation of this report. Preparation of this document would not have been possible without the assistance, expert opinion and input of: Glenn Cambre, Director, Center for Environmental Health Services, Tenney Sibley, Sanitarian Services Program Director, LDHH; Kris Pintado and Dugan Sabins, Senior Environmental Scientists, Office of Environmental Assessment, Louisiana Department of Environmental Quality (LDEQ) and Mike Schaub with the U.S. Environmental Protection Agency. LDHH also wishes to acknowledge the contributions of the Town of Grand Isle, the Cameron Parish Police Jury, Lafourche Parish Police Jury, Louisiana Office of State Parks, the City of Lake Charles, and the Lake Pontchartrain Basin Foundation for their contributions to successful program implementation during 2009.

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Table of Contents

List of Tables

List of Figures

EXECUTIVE SUMMARY

This document was prepared to partially fulfill the Louisiana Department of Health and Hospitals, Office of Public Health, Center for Environmental Health Services (CEHS) reporting obligations under U.S. Environmental Protection Agencies (USEPA) BEACH grant program, Federal Assistance Agreement Numbers CU-97606401-0, CU-976992-01 and CU-96667101-0. Prior to publication of this report, the document was distributed to USEPA and the Louisiana Department of Environmental Quality for comments. The comments provided by both agencies were incorporated into this report. The report was made available to the public through CEHS's Beach Monitoring Program website (http://www.ophbeachmonitoring.com/).

As documented in *Louisiana's BEACH Grant Final Report – Grant Year 2001* (LDHH 2003; the Beach Report), CEHS is to submit an annual technical report to USEPA after the end of the recreational period that summarizes the number of beaches monitored in each Tier, lists any additional beaches to be added to the Program or Tier reassignments to be made in the next year, presents a compilation of sampling results, and summarizes assessment activities and response actions. The report is to also include for Tier 1 and 2 beaches, the number of beach monitoring stations for which advisories were issued, the number of times water quality criteria were exceeded and the number of days under advisories for each beach monitoring station. This report satisfies the reporting obligations set forth in the Beach Report and outlined above.

Due to the lingering impacts of Hurricanes Rita and Ike, levels of use during the 2009 swimming season remained low relative to historic levels at Cameron Parish beaches, and access to Hackberry beach, which was eliminated by Hurricane Ike, remained inaccessible through the 2009 swim season. Grand Isle State Park beach was closed again in 2009 due to construction activities associated with beach restoration along the Park's shoreline to repair lingering damages from Hurricanes Katrina and Gustav. The closure ran from the week of September 16th through the end of the swim season. Use at the remaining beaches during 2009 was at approximately historic levels (as estimated in 2003 and reported in the Beach Report).

Between 6 April 2009 and 27 October 2009, a total of 841 samples were collected at 28 sample stations. Monitoring was initiated and conducted on schedule from the start of the monitoring season (1 April) through the end of the season (31 October). Twenty-six sample stations were monitored at ten Tier 1 or 2 continuous beach segments with a total of 65 advisories issued. All stations had advisories issued during 2009 based on observed water quality exceedances. Compliance by station varied between 96% of monitored days in compliance at GIB3, to a low of only 6% for HOLLY3. In addition to advisories based on observed exceedances, Grand Isle State Park (GISP1-4) was closed from 16 September through the end of the swim season due to construction activities associated with beach restoration. Across all sample stations, 2,153 of the 4,578 available advisory days (47%) were in compliance and not under an advisory. An additional 180 station-days (4% of 4,758 station-days across all Tier 1 and 2 monitored stations) were under a closure not associated with advisories based on observed exceedances.

As in past years, all advisories issued in 2009 resulted from exceedances of enterococci criteria, with exceedance of the geometric mean criterion involved in 93% of advisory-weeks. Fifty-three percent (53%) of the 355 observed advisory-weeks resulted from enterococci geometric mean

exceedances only, and 141 (40%) advisory-weeks resulting from both enterococci geometric mean and single sample maximum exceedances. Only 26 (7%) of the 355 observed advisory-weeks resulted from exceedance of the single sample criterion alone. Accordingly, Louisiana's percentage of monitored station-weeks that were in compliance is not comparable with other states that do not use equivalent decision criteria. If Louisiana's decision rule were based only on the enterococci single sample maximum criterion, the state would have failed to detect 53% of the observed noncompliance weeks. As in 2008, no resamples were collected when single sample exceedances were observed. The fecal coliform geometric mean criterion was not exceeded for any station-week and thus was not involved in any advisories.

With each water sample collected by the BEACH Program, environmental variables were also collected to examine the relationship between environmental conditions and indicator organism density in an effort to better understand what conditions might be predictive of water quality. The environmental variables included water temperature, salinity, tide conditions, weather conditions, and wind direction and speed. Number of days since last rain and precipitation within 0–24 hrs, 24–48 hrs, and 48–72 hours were calculated using precipitation data obtained from Louisiana's Molluscan Shellfish database. Daily precipitation totals were summed into measures of total precipitation within 0-48hrs and 0-72 hours prior to sample collection. In 2004 and 2005, Louisiana's BEACH Program annual reports examination of the relationships among indicator organism densities and environmental conditions were focused on individual sample stations and data collected within the reporting year. In this report, as in 2006-2008, those analyses are focused on continuous beach segments across years to improve the statistical power of those investigations. The availability of multiple years of observations at some stations allowed examination of differences among years and among sample stations within beach segments.

Based on an evaluation of the environmental factors individually, there were no statistically meaningful differences among sample stations within continuous beach segments. However, enterococci densities have changed from year-to-year at all beach segments except FOUR, which has remained stable. During 2009, the only substantive change was the improvement in water quality from the prior year at FNTB and CNSTBC beach segments. High enterococci densities at the Cameron Parish beaches continued during 2009 and appear to be influenced by tide, salinity, rain during the prior 24-48 hours, and WindDirNSEW and WindSpeed, with regional water quality predicted to be best under high salinity, calm winds, low tides, and rainfall within the past 24-48 hours. Controllable sources influencing the high enterococci densities remain unidentified, despite collaborative efforts by LDHH and LDEQ. Exploration of the environmental-indicator organism relationships at the remaining beaches found higher enterococci density was expected at the Grand Isle area group when west winds were blowing, tides were high, skies were cloudy, salinity was high, and there had been substantial rain within the last 72 hours. Water quality at FNTB was predicted to be poorest under cloudy conditions with high amounts of precipitation in the previous 48 hours. At CYPT, the highest densities were predicted to occur when it had rained within 24 hours prior to sample collection, tides were high, and winds were strong.

With the exception of the Lake Charles beaches, which were monitored for the first time under the program in 2009 and thus only one year's data are available, the environmental variables

explained only a small fraction of the total variability in indicator organism density. Thus, those models are not sufficient to be used as predictive models upon which precautionary advisories could be based. They do however provide insight into the environmental factors that influence enterococci density. Given the available environmental data, it is unlikely that models that can reliably predict enterococci densities can be developed for Louisiana's beaches. The relationship between environmental factors and enterococci density is complex and will take more investigation to understand, requiring targeted studies that are not funded under current Beach Grants. Better measurement of the environmental variables that are currently being collected and/or collection of additional environmental measures may be required to adequately predict water quality from observable environmental conditions. Louisiana beaches are somewhat different from those of most coastal states in that they represent a wide range of salinity conditions and most are relatively remote from urban runoff, reducing the direct association between environmental conditions and enterococci densities.

Data quality precision goals were achieved for 2009 fecal coliform and enterococci field duplicates, and all salinity QC samples. However, as in 2008, QC goals for fecal coliform and enterococci field splits were not met although 2009 results were substantially better than those of the prior year. The field split sampling precision goal for fecal coliform and enterococci is 30% RPD but the observed lab RPD for fecal coliform and enterococci exceeded the goal by an estimated 47%. Investigations into the possible case of this discrepancy during 2009 determined that some field samplers were not properly recording the type of QC sample collected, which could explain field split RPD being greater than field duplicate RPD in 2008 and failure to meet the goal in 2009. To ensure that the estimates of field split and field duplicate precision for the 2010 season are accurate, prior to the start of the sampling period the BEACH Program Manager/Quality Assurance Officer will reinforce the need for: 1) proper data recordation, and 2) through mixing of field splits. If the 2010 field split precision goal is not meet, then the lab precision goals may need to be adjusted upward. All monitoring and notification data collected during 2009 have been uploaded to the appropriate EPA data storage systems.

Based on observed use levels and patterns near the end of the 2009 swimming season and projections of use for the 2010 swimming season by program partners and local officials, it is anticipated that use levels and patterns will remain at or return to approximately historic levels for all beaches except for the Cameron Parish beaches. Cameron Parish beaches are expected to operate at 50%-75% of pre-hurricane levels, and Hackberry beach is expected to remain inaccessible during 2010. During 2009, Elmer's Island, which is not currently monitored under the program, was identified as a beach that may warrant monitoring. On 1 June 2009, the Louisiana Department of Wildlife and Fisheries announced that public road access to the island would be restored for the 2009 Fourth of July weekend, and more than 800 visitors accessed the island over the three-day holiday weekend. The island remains accessible to the public for day-use only. During the 2010 swim season, CEHS will assess the number of swimmers using the island and their spatial distribution along the approximately 3.5 mile beachfront to determine if inclusion under the program is warranted and if so, identify possible sample station locations.

The anticipated use and historic water quality risk levels will result in seven beach segments monitored as Tier 1 beaches (Fontainebleau, Grand Isle and Cypremort Point State Parks, Fourchon [FOUR1-3], Holly, and Lake Charles' North and South Beaches), and three beach

segments monitored as Tier 2 (Grand Isle Beach, the Constance Beach Complex, and Hackberry and Rutherford Beaches), and one beach segment monitored as Tier 3 (FOUR4). In 2010, it is anticipated that the Program will monitor 6.7 beach miles as Tier 1 beaches, 14.9 miles as Tier 2 beaches, and 1.6 miles of Tier 3 beaches.

CHAPTER 1. Purpose, Background And 2009 Program Accomplishments

Purpose

According to *Louisiana's BEACH Grant Final Report – Grant Year 2001* (the Beach Report; LDHH 2003), the Louisiana Department of Health and Hospitals (LDHH), Office of Public Health (OPH), Center for Environmental Health Services (CEHS) is to submit an annual technical report to U.S. Environmental Protection Agency (USEPA) after the end of the recreational period. The report should accomplish the following: summarize the number of beaches monitored in each Tier, list any additional beaches to be added to the Program or Tier reassignments to be made in the coming year, provide a compilation of the sampling results, and summarize assessment activities and response actions. This report serves as the annual technical report for the 2009 recreational period and satisfies all of the requirements described above.

This document consists of four chapters. In this chapter, 2009 Program accomplishments are summarized. Chapter 2 contains a summary of the number of beaches that were monitored in each Tier, and a description of updates to Louisiana's BEACH Program, as anticipated under the Beach Report. Louisiana's BEACH Program updates include descriptions of 2009 Program modifications, and changes to Tier assignments and beaches to be monitored under the Program in 2010. In Chapter 3, monitoring and response efforts and results for 2009 are provided. Data quality assessment results for the 2009 data are presented in Chapter 4. Appendices A, B, and C contain station names and EPA IDs, time series analyses of water quality data, and sample results, respectively. Appendix D provides a summary of how Louisiana's BEACH Program has fulfilled the original BEACH Grant requirements.

Background

In many ways, water could be considered Louisiana's greatest natural resource. Louisiana's vast estuarine basins provide a unique playground for swimming, wading, boating, fishing, and other aquatic activities. However, swimming in waters with high bacteria densities from fecal sources are a known threat to public health, causing elevated rates of gastrointestinal illness. LDEQ has historically conducted routine ambient monitoring of state coastal waters designated for primary contact recreation and utilized fecal coliform criteria to assess attainment of ambient water quality standards for swimming uses. However, "high-use" swimming waters had not been designated in state regulations by LDEQ. There were no mechanisms in place to routinely sample water quality at high-use coastal recreation sites or to provide the public with the results of risk-based analyses that allow for an informed decision prior to swimming in selected coastal recreation waters.

In response to growing concern about public health risks posed by polluted bathing beaches, the U.S. Congress passed the BEACH Act in 2000. In 2001 the EPA, under the provisions of the BEACH Act, made grant funds available to the OPH for the development of a monitoring and notification program for high-use coastal recreation sites, referred to as Louisiana's BEACH Program. Since initial grants were awarded, Louisiana's BEACH Program has been developed and successfully implemented under the guidance of the CEHS.

Consistent with EPA's guidance, Louisiana's BEACH Program consists of two primary activities, monitoring and notification. The Program monitors the density of indicator organisms that are used to identify the potential presence and degree of fecal contamination in waters. To monitor bacteriological contamination of surface waters, Louisiana, like most other states, has historically used fecal coliform densities. However, under the terms of BEACH grant awards, states are required to base decisions about marine water quality at sites monitored using BEACH grant funds on enterococci bacteria densities. Enterococci has recently become generally accepted by the scientific community as more closely associated with rates of gastrointestinal illness in marine environments than fecal coliform densities, and thus EPA believes that the use of enterococci may serve to better protect the public health in marine environments. But because Title 51 Part XXIV of the Louisiana State Administrative Code stipulates the use of fecal coliform, the Louisiana Beach Monitoring Program chose to implement both indicator organisms into its decision rule. The use of fecal coliform and enterococci as dual indicators of potential bacteriological contamination allows CEHS to better evaluate the presence of possible pathogens in this unique coastal environment.

The second primary activity under the Program is public notification. The Beach Program issues public health advisories at Tier 1 and 2 monitored sites when water quality samples are found to exceed the enterococci/fecal coliform criteria. The criteria used are a single sample maximum of 104 for enterococci, and steady state criteria based on geometric means of 35 for enterococci and 200 for fecal coliforms (quantities expressed as MPN/100 ml). These advisories urge users to abstain from swimming, but do not officially "close" the water body to recreational use. The Program disseminates swim advisories by press release, website postings, and by opening pole-mounted signs which are installed at the beach monitoring sites. When water quality sample results indicate that bacteria levels at beach sites under swim advisories are once again compliant with the decision rule, the public is notified that the advisory has been lifted through beach signage, press releases, and the website (http://www.ophbeachmonitoring.com/).

Program Accomplishments During 2009

Beaches monitored by the Program in 2009 continued to experience lingering impacts from hurricanes Katrina, Rita (August and September 2005, respectively), and Gustav and Ike (September 2008). Use of Cameron Parish Beaches remained below pre-storm levels, and Hackberry Beach remained inaccessible. Also, beach restoration activities to repair damage caused by the hurricanes continued in 2009 at Grand Isle State Park resulting in beach closures. Fortunately, Louisiana experienced no direct hurricane impacts during 2009.

During 2009, the Louisiana BEACH Program:

1. Monitored all sample sites designated for monitoring in accordance with the requirements of their tier assignment throughout the swimming season. Monitored beaches included two Lake Charles' beaches, North and South Beaches, which were monitored for the first time in 2009;
2. Continued efforts, as described in this report, to conduct a more comprehensive analysis of the relationship between environmental factors and enterococci density; and
3. Continued to meet or exceed the majority of the quality assurance/quality control goals established in the Program's QAPP.

CHAPTER 2 - Update Of BEACH Program

Review of Beach Rankings

In 2003, the CEHS completed a systematic process to identify and rank Louisiana's beaches according to risk, consisting of the following steps (LDHH 2003):

1. Identification and definition of coastal recreation waters,
2. Identification of beaches or similar points of access used by the public for swimming, bathing, surfing, or similar water contact activities,
3. Review of available information on levels of potential fecal contamination at beaches and intensity of beach use, and
4. Ranking of beaches to decide which beaches would be included in Louisiana's BEACH Program.

Based on levels of beach use and perceptions of water quality from estimated fecal coliform densities in adjacent waters, a qualitative ranking scheme was devised and used to assign each beach to an appropriate monitoring tier. The monitoring tiers provide different levels of monitoring and public notification so that beaches with a greater density of swimmers, and thus the greatest number of people at risk, receive higher levels of monitoring and public notification than lower use beaches. Monitoring and public notification procedures are exactly the same at Tier 1 and Tier 2 beaches, but differ in density of sample stations. Sample stations are closer together at Tier 1 beaches, no more than 500 meters apart, than at Tier 2 beaches, where samples stations are no more than 2 miles apart on continuous beach segments. Sample stations at Tier 3 beaches are at the same density as Tier 2 beaches, but samples are not collected weekly, and accordingly, weekly public advisories are not issued for Tier 3 beaches.

The estimated number of swimmers at each beach was based on information obtained primarily from law enforcement officials responsible for patrolling the beach and from park managers. The officials provided estimates of the number of beach visitors on a typical weekday, weekend, and holiday during the peak swimming season, May 1 through Labor Day, along with an estimate of the percentage of beach users entering the water. These estimates were combined by adding typical weekday and weekend use to provide an estimate of weekly use. Weekly use was multiplied by the number of weeks in the recreational period, and added to the estimated number of holiday visitors during Memorial Day, Fourth of July, Labor Day, and any other beach-specific major events. Because the resulting total was an estimate of unknown precision, those estimates were generalized into broad categorizes of use for relative comparison as follows:

Category of Use	Estimated Number of Swimmers
Very Low	<5,000
Low	5,000 to <10,000
Moderate	10,000 to <15,000
High	15,000 to 20,000
Very High	>20,000

Beaches classified as having very high, high, or moderate to high use were assigned to Tier 1 and receive the most monitoring attention. Beaches classified as having moderate use were assigned to Tier 2. Beaches with low or very low use and a water quality ranking based on fecal coliform data that were not collected in close proximity to the beach were assigned to Tier 3 and targeted for additional bacterial indicator monitoring to better characterize risk. Beaches on private land or with existing swimming advisories posted by the State, and with very low public use were excluded from further consideration. A total of 29.16 miles of beach were considered for monitoring under the Louisiana BEACH Program, of which 23 miles have been assigned to a monitoring tier (LDHH 2003).

CEHS anticipated that beach use and water quality could change through time, and planned to re-evaluate beach rankings on an annual basis at the end of each swimming season (LDHH 2003). In 2006, it was decided that the Program would continue to evaluate risk primarily on the estimated density of swimmers at a beach in accordance with the original categories of use described above, but a new method of assessing water quality risk was developed. The original assessment evaluated water quality based on estimated fecal coliform densities. Data collected during 2004 and 2005 provided new information about water quality, including enterococci densities, which were not previously available. Because EPA's chosen indicator organism for marine waters is enterococci, and because all swim advisories issued to date have been based on exceedance of enterococci criteria, new water quality categories based on enterococci densities were developed for use in the risk-based Tier assignment process.

A sample station's enterococci geometric mean density was strongly correlated with the percentage of monitored weeks under an advisory, so a sample station's geometric mean is a good indicator of the likelihood of exceeding the established limits of acceptable risk. Accordingly, water quality risk categories were based on the ratio of a beach's enterococci geometric mean divided by the enterococci geometric mean decision criterion of 35 MPN/100 ml. Water quality risk categories were established as: "Lower Risk", if the beach's geometric mean/35 < 0.5; "Moderate Risk" if the beach's geometric mean/35 ≥ 0.5 and < 1; and "Higher Risk" if the beach's geometric mean/35 ≥ 1.

Based on the revised risk classification, continuous beach segments were assigned to Tiers at the beginning of 2009. Table 1 identifies the beaches that were monitored under the Program during 2009, their designated 2009 monitoring Tier, and associated sample stations. Due to the lingering impacts of Hurricanes Rita and Ike, levels of use during the 2009 swimming season remained low relative to historic levels at Cameron Parish beaches, and Hackberry beach, rendered inaccessible by Hurricane Ike, remained inaccessible through the 2009 swim season. Grand Isle State Park beaches were closed again in 2009 due to construction activities associated with beach restoration along the Park's shoreline to repair lingering damages from Hurricanes Katrina and Gustav. The closure ran from the week of September 16th through the end of the swim season. Use at the remaining beaches during 2009 was at approximately historic levels (as estimated in 2003 and reported in the Beach Report).

During 2009, seven continuous beach segments were designated as Tier 1 beaches and scheduled for monitoring (Grand Isle, Cypremort Point, and Fontainebleau State Parks, Fourchon and Holly beaches, and North and South Beaches in Lake Charles), and three continuous beach segments

were designated as Tier 2 (Grand Isle Beach, Hackberry and Rutherford Beaches, and the Constance Beach Complex). All beaches were monitored at their designated tier level during 2009 except during periods of construction related closure or due to access constraints as mentioned above. Pontchartrain Beach was monitored as a calibration site again in 2009 to continue to gather data to reexamine the swim advisory on that portion of Lake Pontchartrain.

Table 1. Continuous beach segments, beach miles, monitoring Tier assignments for 2009 and 2010, and sample stations.

Continuous Beach Segments	Designated Beach Miles	First Year Sampled	2009 Designated Monitoring Tier	2009 Actual Monitoring Tier	2010 Designated Monitoring Tier	Sample Station State IDs*
Lake Pontchartrain Basin Beaches						
Fontainebleau State Park	0.13	2004	1	1	1	FONT1
Barataria River Basin Beaches						
Grand Isle State Park	1.08	2004	1	1	1	GISP1-4
Grand Isle Beach	6.25	2005	2	2	2	GIB1-3
Fourchon	0.88	2005	1	1	1	FOUR1-3
	1.59	2005	3	3	3	FOUR4
Vermilion-Teche River Basin Beaches						
Cypremort Point State Park	0.47	2004	1	1	1	CYPT1
Calcasieu River Basin - Lake Charles Beaches						
North Beach - Lake Charles	0.42	2009	1	1	1	LCNB1
South Beach & Rabbit Island	0.23	2009	1	1	1	LCSB1
Calcasieu River Basin - Cameron Beaches						
Holly Beach	3.45	2005	1	1	1	HOLLY1-6
Mermentau River Basin Beaches						
Hackberry Beach and Rutherford Beach	2.40	2005	2	2	2	HACK1, RUTH1
Sabine River Basin Beaches						
Constance Beach Complex (CNSTBC)	6.28	2005	2	2	2	CNST1, DUNG1, GBRZ1, LTFL1, MART1

Note: * Sample station names and EPA IDs are provided in Appendix A.

In summary, during 2009, the Program monitored 6.7 Tier 1 beach miles at the seven continuous Tier 1 beach segments, including sampling and public notification at all 17 of the Tier 1 sample stations (Table 2). Three continuous beach segments totaling 14.9 miles were designated as Tier 2 beaches, of which 14.0 miles were monitored including sampling and public notification at 9 sample stations (Hackberry Beach was not monitored due to access constraints). One continuous 1.6-mile beach segment was monitored as a Tier 3 beach.

Table 2. Number of continuous beach segments, sample stations, and beach miles monitored by Tier during 2009 and planned for 2010.

	2009 (Actual)			2010 (Projected)		
	Tier 1	**Tier 2**	**Tier 3**	**Tier 1**	**Tier 2**	**Tier 3**
Number of Continuous Beach Segments	7	3	1	7	3	1
Number of Sample Stations	17	10	1	17	10	1
Total Beach Miles	6.7	14.9	1.6	6.7	14.9	1.6
Number of Continuous Beach Segments Monitored	7	3	1	7	3	1
Number of Sample Stations Monitored	17	9	1	17	10	1
Total Beach Miles Monitored	6.7	14.0	1.6	6.7	14.9	1.6

For the 2010 swimming season, it is anticipated that use levels and patterns will remain at or return to approximately historic levels for all beaches except for the Cameron Parish beaches, and FOUR4. Cameron Parish beaches are expected to continue to operate at 50%-75% of pre-hurricane Rita levels, and Hackberry beach use is expected to remain limited during 2010 due to continuing access constraints. Use at Fourchon Beach is expected to remain at historic levels, but obstacles constructed in 2007 and limiting eastward vehicular travel along the beach remain. Those obstacles significantly reduce use and sampling accessibility at the east most portion of Fourchon where the FOUR4 sample station is located. Accordingly, FOUR4 will remain designated as a Tier 3 beach until full access is restored.

Using 2009 water quality data, water quality risk categories were also calculated for each continuous beach segment for use in establishing 2010 Tier assignments (Table 3). Three continuous beach segments were classified in the lower water quality risk category (Grand Isle and Fourchon Beaches, and Fontainebleau State Park), one in the moderate risk category (Grand Isle State Park) and six in the higher risk category (Constance Beach Complex, Cypremort Point State Park, Hackberry and Rutherford Beaches, Holly Beach, and North Beach and South Beach in Lake Charles). Figure 1 shows the strong inverse linear relationship (R-Squared = 0.74, P = 0.001) between enterococci geometric mean / 35 criteria and the percent of monitored days with no advisories, and how the likelihood of an advisory increases within higher water quality risk categories.

For comparison with the Louisiana's BEACH Program's beach risk classification, the World Health Organization's (WHO) microbial water quality assessment criteria (WHO 2003) was applied to Louisiana's 2009 water quality data and the results are provided in Table 3. The WHO uses the 95th percentile because it is easily understood and reflects much of the top-end variability in the distribution of water quality data that are of greatest public health concern. The WHO classifies water quality into four categories based on the risk of acquiring gastrointestinal illness as follows: A <1 case in 100 exposures, 95th percentile ≤40; B <1 case in 20 exposures, 95th percentile 41-200; C <1 case in 10 exposures, 95th percentile 201-500; and D >1 case in 10 exposures, 95th percentile >500. For comparison, the EPA's accepted gastrointestinal illness rate for marine recreational waters is 19 illnesses per 1,000 swimmers, which is slightly higher than the 10 cases per 1000 swimmers equivalent for WHO category A, but less than 50 cases per 1000 swimmers, or the equivalent of WHO category B. The WHO classification system also uses sanitary inspection categories to classify waters from very good to very poor, depending on the

beach's susceptibility to fecal influence as determined by a sanitary survey. The sanitary inspection categories for microbial water quality A, B, C, and D are very good to good, good to fair, fair to poor, and poor to very poor, respectively.

Table 3. Beach water quality and use risk categories for 2010 swimming season based on anticipated use in 2010 and 2009 water quality data.

Continuous Beach Segments	Anticipated 2010 Use	2009 Entero. Geometric Mean	2009 Entero. Geometric Mean / 35	2009 Water Quality Risk Category	Entero. 95th Parametric Percentile All Data	WHO Risk Category
CNSTBC	Low	41.6	119%	Higher	592	D
CYPT	Mod.-High	110.0	314%	Higher	397	C
FNTB	High	10.6	30%	Lower	142	B
FOUR	Very High	16.4	47%	Lower	111	B
GIB	Moderate	15.9	45%	Lower	50	B
GISP	Very High	25.5	73%	Moderate	101	B
HACK-RUTH	Very Low	69.3	198%	Higher	508	D
HOLLY	Mod.-High	63.3	181%	Higher	501	D
LCNB	Very High	83.0	237%	Higher	572	D
LCSB	Very High	107.4	307%	Higher	1,909	D
PONT*	Very Low	22.5	64%	Moderate	175	B

Notes: * PONT is not currently a BEACH Act beach but is being sampled to obtain data to evaluate the long-standing swim advisory affecting the site.

Applying the WHO classification to data collected through 2009, Louisiana has: no very good to good (WHO cat. A) continuous beach segment; four good to fair (WHO cat. B) beach segments (Fontainebleau and Grand Isle State Parks, and Fourchon and Grand Isle Beaches); one fair to poor (WHO cat. C) beach segment (Cypremort Point State Park); and five poor to very poor (WHO cat. D) beach segments (Constance Beach Complex, Hackberry and Rutherford Beaches, Holly Beach, and North and South Beaches in Lake Charles). Although Louisiana's classification system is a coarser system than the WHO system, the water quality rankings under Louisiana's and the WHO's systems closely match. That is, beach segments ranked as Lower or Moderate under the Louisiana system were ranked in WHO categories B (good to fair), and those ranked as Higher have a corresponding WHO category of C (fair to poor) or D (poor to very poor). Pontchartrain Beach, if designated as a Louisiana BEACH program beach, would be ranked as a Moderate risk beach under the Louisiana system, and as a category B under the WHO system.

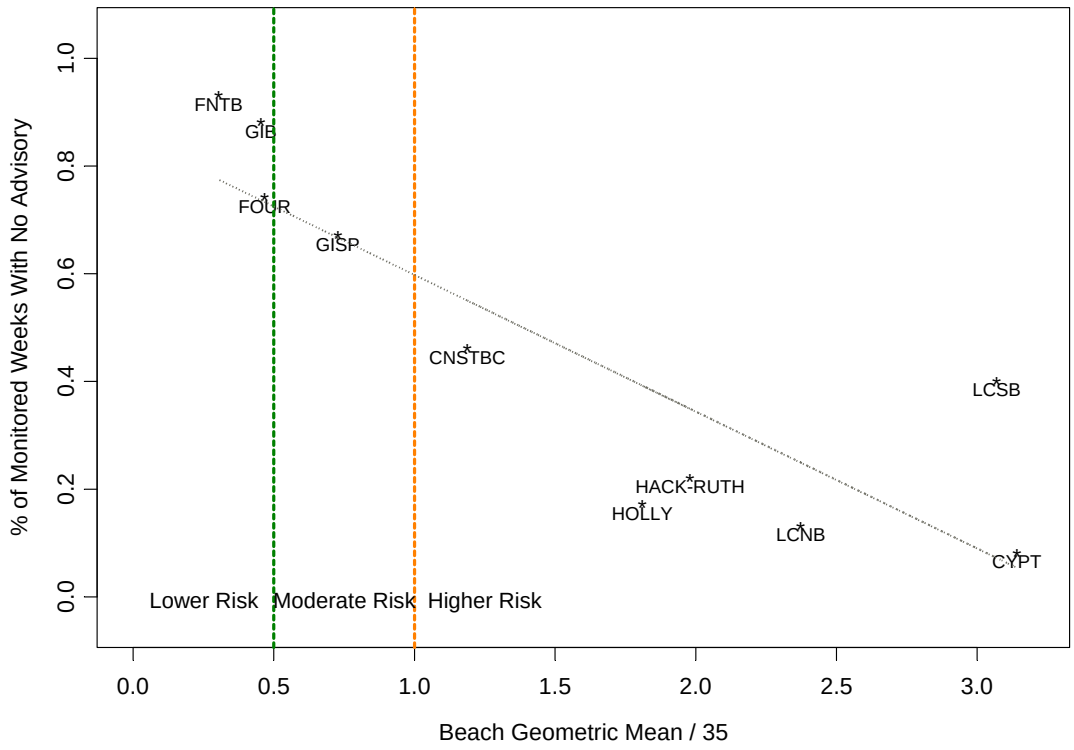

Figure 1. Water quality risk categories based on a continuous beach segment's enterococci geometric mean/35 and percent of monitored weeks without an advisory for 2009.

Combined 2009 use and water quality rankings for each continuous beach segment are given in Table 4. As discussed above, tier categories remain based on the same swimmer density categories that were used in the original tier designation system, but low and very low use categories are designated as "Discretionary". For "Discretionary" beach segments, the Louisiana BEACH Program Manager will decide if Tier 2 or 3 level monitoring is warranted at any time during the monitoring season. Because of the higher water quality risk at Constance Beach Complex and Hackberry-Rutherford beaches, it is anticipated that they will be monitored as Tier 2 beaches during 2010. As shown in Table 1, the anticipated use and historic water quality risk levels will result in seven beach segments monitored as Tier 1 beaches (Fontainebleau, Grand Isle and Cypremort Point State Parks, Fourchon [FOUR1-3], Holly, and North and South Beaches), and three beach segments monitored as Tier 2 (Grand Isle Beach, the Constance Beach Complex, and Hackberry and Rutherford Beaches), and one beach segments monitored as Tier 3 (FOUR4). In 2010, it is anticipated that the Program will monitor 6.7 beach miles as Tier 1 beaches, 14.9 miles as Tier 2 beaches, and 1.6 miles of Tier 3 beach (Table 2).

In addition to annually re-evaluating risk levels and associated tier designations for beach segments monitored during the previous year, the program determines if any additional beaches warrant monitoring. Only one such beach, Elmer's Island, has been identified. Elmer's Island is located between Fourchon and Grand Isle Beaches, and was considered for inclusion in the program when the Louisiana BEACH Program was established (LDHH 2001), but was not included at that time because the beach was privately owned and accessible to the public by boat

only. Historically, the island had been accessible by road from Louisiana Hwy. 1 for an entrance fee, but that point of entry was closed in 2000. In mid-December 2008, the state opened 250 acres of Elmer's Island for public use, via boat access, after extensive title research found that the beachfront portion of the island is the property of Louisiana (see Figure 2). On 1 June 2009, the Louisiana Department of Wildlife and Fisheries announced that public road access to the island would be restored for the 2009 Fourth of July weekend, and more than 800 visitors accessed the island over the three-day holiday weekend. The island remains accessible to the public for day-use. During the 2010 swim season, CEHS will assess the number of swimmers using the island and their spatial distribution along the approximately 3.5 mile beachfront to determine if inclusion under the program is warranted and if so, identify possible sample station locations.

Table 4. Combined beach use and water quality risk categories for 2010.

# of Swimmers[2] =▲	Water Quality Risk[1] =►				
	Lower Risk	**Moderate Risk**	**Higher Risk**	**Unknown**	
VH	FOUR1-3	GISP	LCNB, LCSB		**Tier 1**
H	FNTB		CYPT, HOLLY		
M	GIB				**Tier 2**
L			CNSTBC[4]		**Tier3**
VL	FOUR4	PONT[3]	HACK-RUTH[4]		
	Discretionary				

Notes: [1]Water quality risk level based on 2009 data. [2]Number of swimmers based on expected use relative to historic norms. [3]PONT is not currently a BEACH Act beach but is being sampled to obtain data to evaluate the long-standing swim advisory affecting the site. [4]CNSTBC and HACK-RUTH will be monitored as tier 2 beaches during 2010.

Program Modifications

No modifications were made to the Program's procedures, methods or decision rule during 2009. All changes that were made in prior years to the Program's procedures, methods or decision rule are summarized in *Louisiana's BEACH Program Quality Assurance Project Plan, Version 2.c*, Appendix B, which is available on the world wide web at http://www.ophbeachmonitoring.com/.

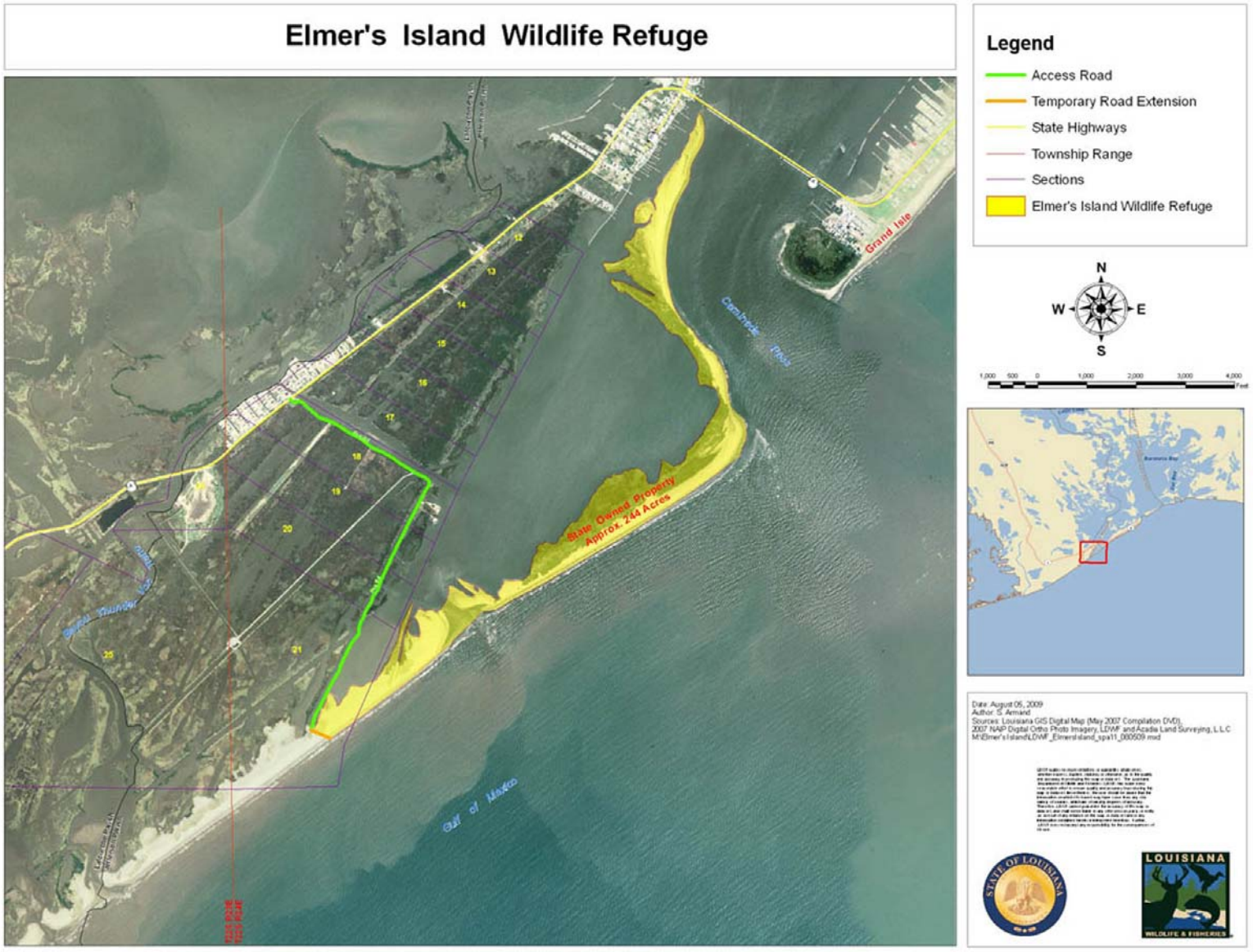

Figure 2. Elmer's Island location map. (Source: Louisiana Department of Wildlife and Fisheries).

CHAPTER 3. Louisiana BEACH Program's 2009 Results

Number of Samples Collected

Between 6 April 2009 and 27 October 2009, a total of 841 samples were collected at 28 sample stations (see Table 5), distributed among five sample types: calibration, field duplicates and splits, resample, and routine samples. Each type of sampling is described below.

Table 5. Total number of samples collected by sample station and sample type during 2009 by Louisiana's BEACH Program.

	Sample Type					
Sample Station	**Calibration**	**Field Duplicate**	**Field Split**	**Resample**	**Routine**	**Station Total**
CNST1	0	0	3	0	30	**33**
CYPT1	0	1	4	0	30	**35**
DUNG1	0	2	2	0	30	**34**
FNTB1	0	0	0	0	28	**28**
FOUR1	0	1	1	0	27	**29**
FOUR2	0	0	1	0	27	**28**
FOUR3	0	1	3	0	27	**31**
FOUR4	0	2	0	0	6	**8**
GBRZ1	0	2	1	0	30	**33**
GIB1	0	1	3	0	28	**32**
GIB2	0	4	0	0	28	**32**
GIB3	0	2	0	0	28	**30**
GISP1	0	1	2	0	21	**24**
GISP2	0	2	1	0	21	**24**
GISP3	0	1	2	0	21	**24**
GISP4	0	5	1	0	21	**27**
HOLLY1	0	2	1	0	30	**33**
HOLLY2	0	1	1	0	30	**32**
HOLLY3	0	0	2	0	30	**32**
HOLLY4	0	2	2	0	30	**34**
HOLLY5	0	1	2	0	30	**33**
HOLLY6	0	1	1	0	30	**32**
LCNB1	0	3	3	0	30	**36**
LCSB1	0	0	0	0	30	**30**
LTFL1	0	0	3	0	30	**33**
MART1	0	1	2	0	30	**33**
PONT1	28	0	0	0	0	**28**
RUTH1	0	3	1	0	29	**33**
Sample Type Total	**28**	**39**	**42**	**0**	**732**	**841**

Routine samples are the regularly scheduled weekly samples collected during the designated monitoring period at beaches that are officially part of the Program. A total of 732 routine

samples were collected across 27 sample locations monitored in 2009. Calibration samples are samples collected at sample locations that are not officially part of the Louisiana's BEACH Program, in this case, Pontchartrain Beach (PONT1). A total of 28 calibration samples were collected at the PONT1 sample station to gather information for the future reassessment of the long-standing swimming advisory on the south shore of the lake. Resamples are collected at the BEACH Program Manager's discretion when a routine sample results in an unexpectedly high indicator organism density or when the source of an exceedance is known and has been corrected and extra samples are required to calculate a post-event geometric mean. There were no resamples collected during 2009.

Field duplicate and field splits are two types of quality control (QC) samples. Field duplicates were used to estimate the precision of sampling methods by comparing laboratory results for two samples taken consecutively on the same day at the same sampling site. Field splits were used to estimate the precision of laboratory analyses (intra-laboratory) plus any variability induced during sample handling and transport by analyzing two aliquots of the same water sample, which were subdivided in the field. Louisiana's BEACH Program QAPP requires that approximately 10% of scheduled samples be designated as quality control samples, which were selected at random at the beginning of the sampling period in approximately equal proportions ($\simeq$ 5% each) of field duplicate and field split samples. QC samples are also typically collected during resample events to improve the precision of estimated indicator organism densities by averaging resample and QC sample results. A total of 39 field duplicates and 42 field split samples were collected during 2009. A total of 86 QC samples were scheduled to be collected concurrent with the 732 routine samples and 28 calibration samples that were collected, and were to consist of 42 field duplicates and 44 field split samples. Thirty-six (36) field duplicates were sampled as scheduled (86%), and 39 field split samples were collected as scheduled (89%), resulting in 87% of scheduled QC samples collected. Three scheduled field duplicate samples were collected as field splits, one scheduled field split sample was collected as a field duplicate, and two unscheduled field duplicate samples were collected, resulting in a total of 39 field duplicate and 42 field split quality control samples collected, or 94% of the QC sample goal achieved.

Of the 841 total samples, all were collected during the designated monitoring period, and those collected at Tier 1 and 2 beaches were used to make weekly water quality decisions. For analysis purposes, samples collected on the same date at the same location were not considered independent, and were averaged together resulting in a total of 760 independent samples collected during the 2009 designated monitoring season (see Table 6).

Summary Statistics For 2009 Designated Monitoring Period Samples

Results of fecal coliform and enterococci densities (MPN/100ml) and salinity (parts per thousand; ppt) for each sample location during the 2009 designated monitoring period are summarized in Table 7, and those summaries are depicted graphically in Figures 3 through 6. Because indicator organism densities are lognormal distributed, Table 7 presents $\log_e$ mean and $\log_e$ standard deviations; exponentiation of the $\log_e$ mean produces the geometric mean on the nominal scale. Note that $\log_e$ fecal coliform and $\log_e$ enterococci medians shown in the graphs and $\log_e$ means in Table 7 are approximately equal as would be expected for lognormal

distributed populations. It is also important to note that the results for FOUR4 and GISP sample stations must be interpreted with caution due to the small sample size for FOUR4, and GISP samples were not distributed throughout the year and thus cannot be considered fully representative of the swimming season.

Table 6. Number of independent samples collected by sample station during the 2009 monitoring season (1 April – 31 October). Samples collected at the same station on the same day are counted as a single sample.

Sample Station	Number of Samples
CNST1	30
CYPT1	30
DUNG1	30
FNTB1	28
FOUR1	27
FOUR2	27
FOUR3	27
FOUR4	6
GBRZ1	30
GIB1	28
GIB2	28
GIB3	28
GISP1	21
GISP2	21
GISP3	21
GISP4	21
HOLLY1	30
HOLLY2	30
HOLLY3	30
HOLLY4	30
HOLLY5	30
HOLLY6	30
LCNB1	30
LCSB1	30
LTFL1	30
MART1	30
PONT1	28
RUTH1	29
Totals	**760**

Table 7. Summary statistics for fecal coliform and enterococci density (MPN/100ml), and salinity for samples collected during the 2009 designated monitoring season by sample station.

	Fecal Coliform			Enterococci			Salinity (ppt)		
State ID	Geo. Mean	Log_e Mean	Log_e St. Dev.	Geo. Mean	Log_e Mean	Log_e St. Dev.	Mean	St. Dev	n
CNST1	3.43	1.23	0.77	43.31	3.77	1.64	28.54	6.38	30
CYPT1	14.36	2.66	1.42	109.96	4.70	1.73	5.20	3.46	30
DUNG1	5.03	1.62	1.24	43.41	3.77	1.69	28.50	6.39	30
FNTB1	18.65	2.93	1.57	10.63	2.36	0.98	4.05	0.68	28
FOUR1	6.50	1.87	1.14	20.03	3.00	1.64	23.95	4.85	27
FOUR2	4.47	1.50	1.08	13.49	2.60	1.58	24.41	4.94	27
FOUR3	5.76	1.75	1.36	17.66	2.87	1.60	24.60	5.10	27
FOUR4	5.28	1.66	0.83	11.09	2.41	1.12	23.30	4.88	6
GBRZ1	3.49	1.25	0.88	46.04	3.83	1.59	28.79	6.43	30
GIB1	6.84	1.92	1.20	17.33	2.85	1.14	21.52	6.23	28
GIB2	7.16	1.97	1.16	19.73	2.98	1.25	22.13	6.00	28
GIB3	5.39	1.69	1.11	11.79	2.47	1.04	22.38	6.15	28
GISP1	23.33	3.15	1.71	20.34	3.01	1.55	19.47	6.42	21
GISP2	20.22	3.01	1.44	18.65	2.93	1.46	19.52	6.39	21
GISP3	38.08	3.64	1.52	29.32	3.38	1.51	19.71	6.55	21
GISP4	46.26	3.83	1.87	37.99	3.64	1.66	19.90	6.41	21
HOLLY1	5.23	1.65	1.07	58.62	4.07	1.47	27.97	6.57	30
HOLLY2	5.30	1.67	1.01	65.15	4.18	1.33	28.04	6.60	30
HOLLY3	6.54	1.88	1.29	63.33	4.15	1.62	28.24	6.51	30
HOLLY4	6.42	1.86	1.33	58.04	4.06	1.50	28.08	6.60	30
HOLLY5	6.71	1.90	1.66	62.51	4.14	1.58	28.19	6.40	30
HOLLY6	6.01	1.79	1.46	73.47	4.30	1.32	28.27	6.46	30
LCNB1	39.80	3.68	1.73	83.03	4.42	1.17	6.25	4.48	30
LCSB1	49.30	3.90	1.73	107.41	4.68	1.75	9.52	6.38	30
LTFL1	4.36	1.47	1.01	37.84	3.63	1.41	28.69	6.47	30
MART1	4.70	1.55	1.03	38.06	3.64	1.38	28.56	6.71	30
PONT1	35.07	3.56	1.59	22.51	3.11	1.48	5.64	0.86	28
RUTH1	3.43	1.23	0.89	69.29	4.24	1.53	27.18	7.29	29

Note: values for FOUR4 and all GISP sample stations should be interpreted with caution given FOUR4's small sample size and the extreme disturbance of sediments at GISP due to beach restoration activities.

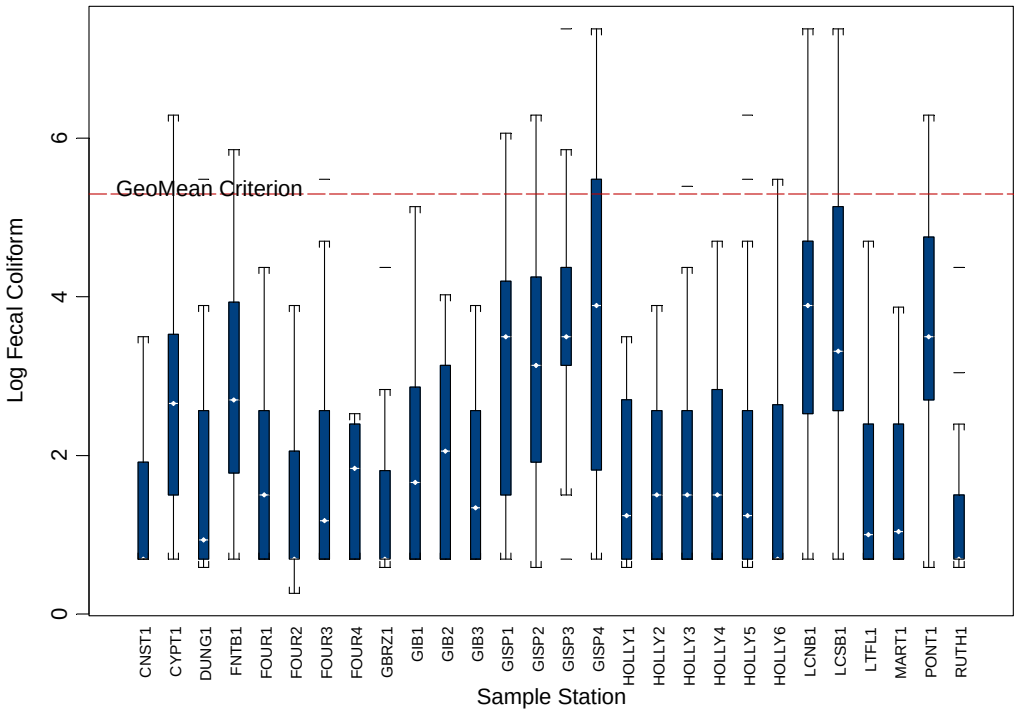

Figure 3. The distribution of $\log_e$ transformed fecal coliform densities (MPN/100ml) by sample station and relative to the geometric mean criterion for samples collected during the 2009 designated monitoring season. The box represents the inner quartile range (25th to 75th percentiles), and upper and lower whiskers extending from the box represent the smallest and largest observations within one step (1.5 times inner quartile range). The median (◊) is marked by a line through the box, and horizontal bars (—) represent extreme values.

Figures 3 and 4 show the distribution of $\log_e$ fecal coliform and $\log_e$ enterococci densities (MPN/100ml), respectively, by sample station and relative to the decision criteria for samples collected during the 2009 designated monitoring season. Figure 5 shows the relationship between fecal coliform and enterococci geometric mean densities by sample station for samples collected during the 2009 designated monitoring season. As shown in the graph, there is a poor correlation between a sample station's geometric mean fecal coliform and enterococci densities. A rigorous statistical analysis of the relationship between fecal coliform and enterococci densities was presented in the *Louisiana BEACH Grant Report, 2007 Swimming Season*. That analysis concluded that although the relationship between fecal coliform and enterococci was positive (higher levels of enterococci are associated with higher levels of fecal coliform), the relationship is quite complex, making the prediction of enterococci density from historic fecal coliform data complex and imprecise. The complexity of the relationship between fecal coliform and enterococci is due in part to the differences in salinity among sample stations as shown in Figure 6.

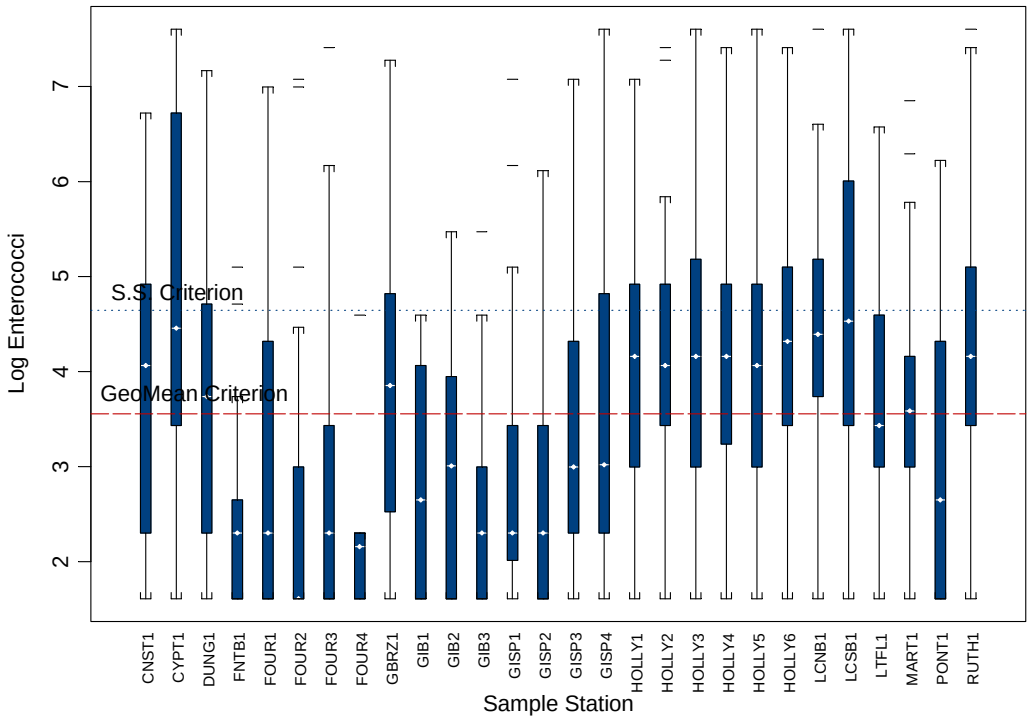

Figure 4. The distribution of $\log_e$ transformed enterococci densities (MPN/100ml) by sample station and relative to geometric mean and single sample maximum criteria for samples collected during the 2009 designated monitoring season.

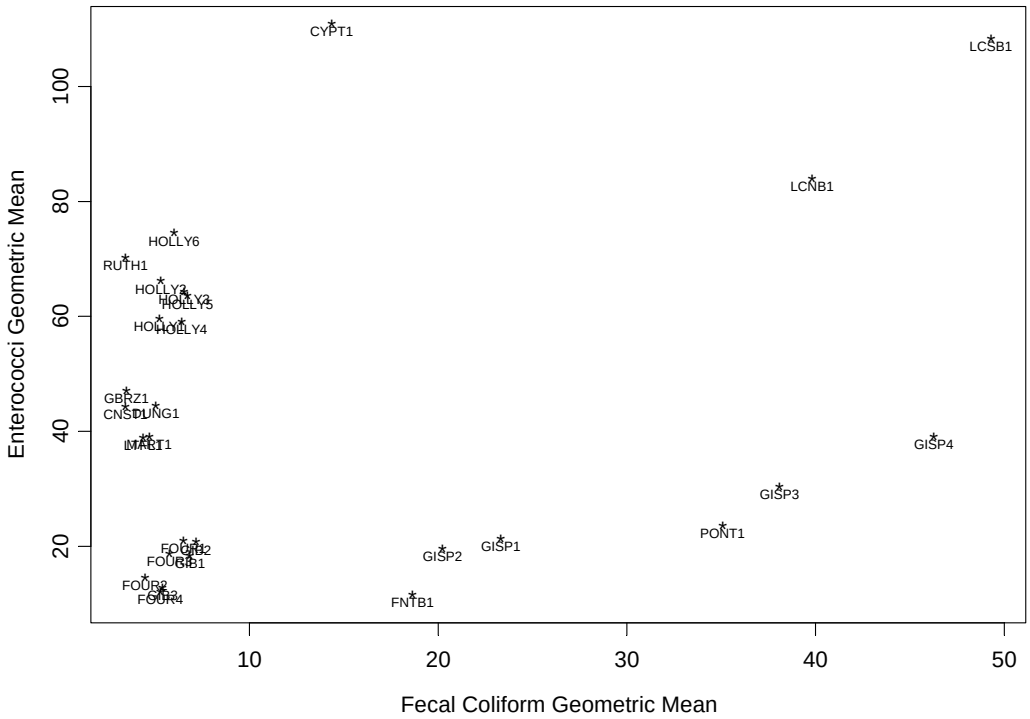

Figure 5. Fecal coliform and enterococci geometric mean densities (MPN/100ml) by sample station for samples collected during the 2009 designated monitoring season.

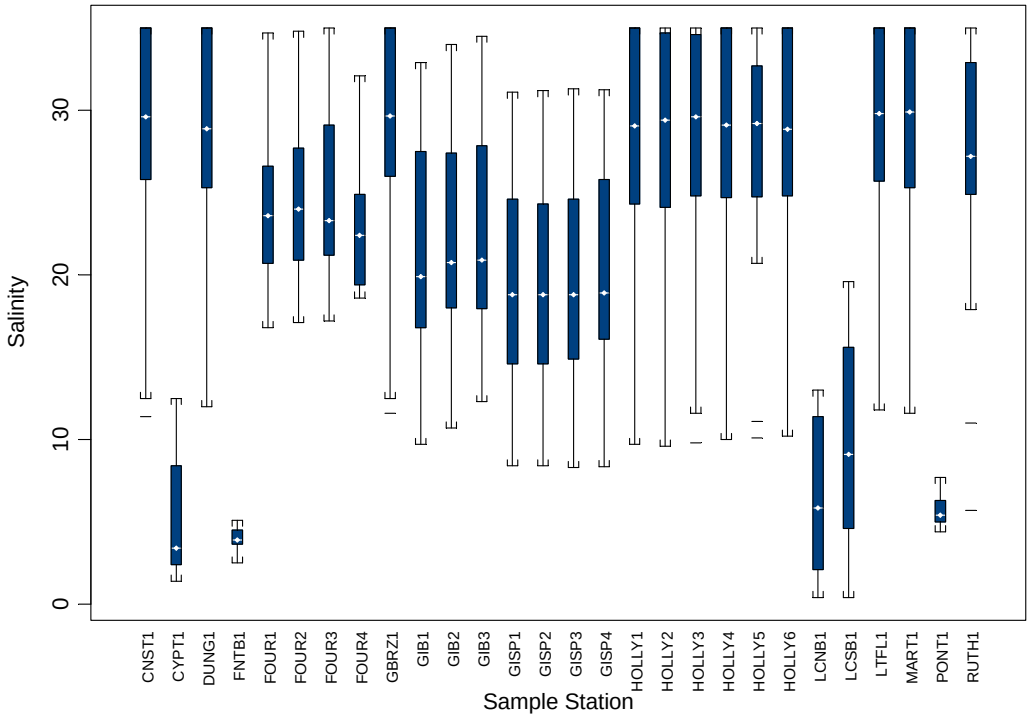

Figure 6. The distribution of salinity (ppt) by sample station for samples collected during the 2009 designated monitoring season.

Time-Series of 2009 Designated Monitoring Period Samples

In addition to calculating summary statistics for each sample station over the 2009 designated monitoring period, results are presented as a time-series (Appendix B, Figures B.1 through B.28; data for each sample event is provided in Appendix C). Because sample results were used during the designated monitoring season to make weekly determinations of whether or not water quality at each sample station met the Program's water quality criteria for Tier 1 and 2 beaches, sample results and the running 30-day geometric mean are shown in the figures. In each week, the last enterococci sample of the week and the running 30-day geometric mean for enterococci and fecal coliform must both be less than or equal to their respective criterion for the sample station to be classified as in compliance. If any criterion was exceeded, the sample station was classified as not in compliance and a swimming advisory was issued. The advisory remained in effect until the most recent sample results and the running geometric means were all less than or equal to their respective criterion.

Weekly Decision Rule Outcomes

During the 2009 swimming season (1 May – 31 October), 26 sample stations were monitored at eight Tier 1 or 2 continuous beach segments with a total of 65 advisories issued. Advisories were issued at all stations during 2009 based on observed water quality exceedances (see Tables

8 and 9). Compliance by station varied between 96% of monitored days in compliance at GIB3, to a low of only 6% for HOLLY3. In addition to advisories based on observed exceedances, Grand Isle State Park (stations GISP1-4) was closed from 16 September through the end of the 2009 swim season due to construction activities associated with beach restoration. Across all sample stations, 2,153 of the 4,578 available advisory days (47%) were in compliance and not under an advisory. An additional 180 station-days (4% of 4,758 station-days across all Tier 1 and 2 monitored stations) were under a closure not associated with advisories based on observed exceedances.

All advisories issued in 2009 resulted from exceedances of enterococci criteria (Table 10). More specifically, the geometric mean criterion was exceeded in 334 of 355 observed noncompliance weeks (93%), with 188 (53%) of those noncompliance weeks resulting from enterococci geometric mean exceedances only, and 141 (40%) resulting from both enterococci geometric mean and single sample maximum exceedances. Only 26 (7%) of the 355 observed exceedances were the result of exceedance of the single sample criterion alone. Accordingly, Louisiana's percentage of monitored station-weeks that were in compliance is not comparable with other states that do not use equivalent decision criteria. If Louisiana's decision rule were based only on the enterococci single sample maximum criterion, the state would have failed to detect 53% of the observed noncompliance weeks. The fecal coliform geometric mean criterion was not exceeded for any station-week during the 2009 monitoring season and thus was not involved in any advisories.

When exceedances of water quality criteria were detected, an advisory was issued. To notify the public that a swimming advisory was in effect the BEACH Program's monitoring/advisory sign at the sample site was opened, a press release was issued, and notice of the advisory was placed on the OPH BEACH website (www.ophbeachmonitoring.com).

Table 8. Advisory history by sample station and week for beach segments designated and monitored as either Tier 1 or Tier 2 beaches during the 2009 swimming season.

	Friday of Week – 2009 Swimming Season																								
Station ID	8 May	15 May	22 May	29 May	5 Jun	12 Jun	19 Jun	26 Jun	3 Jul	10 Jul	17 Jul	24 Jul	31 Jul	7 Aug	14 Aug	21 Aug	28 Aug	4 Sep	11 Sep	18 Sep	25 Sep	2 Oct	9 Oct	16 Oct	23 Oct	30 Oct
CNST1	A	A	A	A	A	A	A	A	A	A		A												A	A	A
CYPT1	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
DUNG1		A	A	A	A	A	A	A				A	A	A				A	A	A	A	A	A	A		A
FNTB1										A										A						
FOUR1								A	A	A	A	A	A	A		A										
FOUR2								A	A	A	A	A	A													
FOUR3								A	A	A	A	A	A			A										
GBRZ1	A	A	A	A	A	A	A	A	A	A		A	A	A						A				A	A	A
GIB1										A	A	A	A	A												
GIB2										A						A				A				A		
GIB3																		A								
GISP1												A	A	A	A	A				C	C	C	C	C	C	C
GISP2										A	A	A	A	A	A	A		A		C	C	C	C	C	C	C
GISP3										A	A	A	A	A		A		A		C	C	C	C	C	C	C
GISP4										A	A	A	A	A		A		A		C	C	C	C	C	C	C
HOLLY1		A	A	A	A	A	A	A	A	A	A	A					A	A	A	A	A	A	A	A	A	A
HOLLY2		A	A	A	A	A	A	A	A	A	A	A					A	A	A	A	A	A	A	A	A	A
HOLLY3		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
HOLLY4		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A			A	A	A
HOLLY5		A	A	A	A	A	A	A	A	A	A	A			A	A	A	A	A	A	A	A	A	A	A	A
HOLLY6		A	A	A	A	A	A	A	A	A	A	A	A	A				A	A	A	A	A	A	A	A	A
LCNB1	A	A	A	A	A	A	A	A	A			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
LCSB1	A	A										A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
LTFL1	A	A	A	A	A	A	A	A		A		A												A	A	A
MART1		A	A	A	A	A	A					A				A				A	A	A	A	A	A	A
RUTH1			A	A	A	A	A	A	A	A	A	A	A				A	A	A	A	A	A	A	A	A	A

Notes: **"A"** indicates an advisory was put in place or remained in effect at the beach based on observed water quality data. "C" indicates a closure was put in place or remained in effect at the beach due to construction activities.

Table 9. Summary of 2009 advisories and closures.

State ID	Days Under Closure	% of Station-Days Under Closure	Available Advisory Days	Days Under Advisory	% of Available Season Under Advisory	% of Available Season In Compliance
CNST1		0%	183	90	49%	51%
CYPT1		0%	183	170	93%	7%
DUNG1		0%	183	120	66%	34%
FNTB1		0%	183	14	8%	92%
FOUR1		0%	183	55	30%	70%
FOUR2		0%	183	43	24%	76%
FOUR3		0%	183	49	27%	73%
FOUR4		0%	NA	NA	NA	NA
GBRZ1		0%	183	113	62%	38%
GIB1		0%	183	34	19%	81%
GIB2		0%	183	27	15%	85%
GIB3		0%	183	8	4%	96%
GISP1	45	33%	138	33	24%	76%
GISP2	45	33%	138	56	41%	59%
GISP3	45	33%	138	48	35%	65%
GISP4	45	33%	138	48	35%	65%
HACK1		0%	NA	NA	NA	NA
HOLLY1		0%	183	143	78%	22%
HOLLY2		0%	183	144	78%	22%
HOLLY3		0%	183	172	94%	6%
HOLLY4		0%	183	151	83%	17%
HOLLY5		0%	183	157	86%	14%
HOLLY6		0%	183	151	82%	18%
LCNB1		0%	183	161	88%	12%
LCSB1		0%	183	112	61%	39%
LTFL1		0%	183	82	45%	55%
MART1		0%	183	99	54%	46%
RUTH1		0%	183	144	79%	21%
Totals	180	4%	4,578	2,425	53%	47%

Table 10. Summary of weekly decision rule exceedances by cause for 2009.

Cause of Exceedance	Number of Observed Exceedances	% of Observed Exceedances
Only fecal coliform geometric mean criteria exceeded	0	0%
Only Enterococci geometric mean criteria exceeded	188	53%
Only Enterococci single sample max criteria exceeded	26	7%
Both Enterococci geometric mean and single sample max criteria exceeded	141	40%
All criteria exceeded	0	0%
Total	**355**	**100%**

Relationship Between Indicator Organisms and Environmental Conditions

The Louisiana BEACH Program uses both fecal coliform and enterococci as indicator organisms in its decision rule to determine beach water quality compliance. Enterococci are used because recent studies have shown that they perform better than fecal coliform in marine waters as they are more closely correlated with gastroenteritis rates (see USEPA 2002 for a review of indicator organisms). Fecal coliform was included in Louisiana's BEACH Program's decision rule primarily because it is specified in the state's Sanitary Code (LAC 51:XXIV §909.B) and Water Quality Standards (LAC 33:IX §1113.5.a) as the indicator organism for determining water quality in natural waters. Secondarily, fecal coliform was included because all historic bacteriological water quality data collected by the State, other than under the BEACH Program, consists of fecal coliform densities.

In order to associate historic patterns of water quality with current patterns based on enterococci densities, the relationship between fecal coliform and enterococci densities was examined in past BEACH Reports. A rigorous statistical analysis of the relationship between fecal coliform and enterococci densities was presented in the *Louisiana BEACH Grant Report, 2007 Swimming Season*. Through that analysis we learned that although the relationship between fecal coliform and enterococci was positive (higher levels of enterococci are associated with higher levels of fecal coliform), it varied among continuous beach segments by year (i.e., different intercepts and slopes for each beach segment-year) and required adjustment for the effects of water temperature. Accordingly, it was concluded that the relationship is quite complex, making the prediction of enterococci density from historic fecal coliform data complex and imprecise.

Of greater interest than the relationship between indicator organisms is how the density of indicator organisms is influenced by environmental factors. With each water sample collected by the BEACH Program, environmental variables were also collected, including surface water temperature (°F), salinity (ppt), tide conditions, weather conditions, and wind direction and speed. Total precipitation (in.) 0–24 hrs (precip0), 24–48 hrs (preciplag1), 48–72 hrs (preciplag2), 72–96 hrs (preciplag3) prior to sample collection were estimated using rain basin precipitation values calculated using the Louisiana's Molluscan Shellfish database. Rain basin daily precipitation was estimated by averaging observed precipitation for rain gauges within the rain basin, and beaches were assigned to the rain basin in which they occurred. The number of days between sample collection and the most recent prior day with a precipitation record > 0 (DaysSinceLastRain) was estimated, and daily precipitation estimates were summed into measures of total precipitation within 0–48 hrs (precip48) and 0–72 hrs (precip72) prior to sample collection.

In the first two Louisiana BEACH Program annual reports (2004 and 2005), the evaluations of the relationships among indicator organism densities and environmental conditions focused on individual sample stations and data collected within the reporting year. In this report, as in 2006 - 2008, those analyses are focused on continuous beach segments across years to improve the statistical power of those investigations. Having multiple years of observations at sample stations also allows examination of differences among years within beach segments. The number of independent swimming season samples collected for each continuous beach segment by year is summarized in Table 11.

Knowing the influence of environmental factor on indicator organism densities can help identify possible sources of elevated bacteria levels. That knowledge is also required to develop predictive models, which EPA has encouraged BEACH Program participants to do because of 1) the poor relationship in day-to-day indicator organism densities (temporal autocorrelation) in natural waters and 2) the protracted time between sample collection and obtaining results. Predictive models are used to predict when water quality standards are likely to be exceeded based on readily observable conditions, and provide a basis for issuing precautionary advisories. Discussed below are Louisiana's efforts to develop predictive models for investigating how the density of indicator organisms is influenced by environmental factors. When applicable, the differences in environmental variables among sample stations and years within beach segments were also examined. We also examined regional influences for beach segments in close proximity to each other with similar environmental conditions and water quality. Three such area groups were identified: 1) Grand Isle area group consisting of Grand Isle State Park, Grand Isle Beach, and Fourchon segments, 2) Cameron Parish area group consisting of Hackberry-Rutherford and Holly beaches, and Constance Beach complex, and 3) Lake Charles area group consisting of North and South Beaches.

Because all advisories issued from program inception in 2004 through 2009 were issued in response to exceedance of enterococci criteria, with greater than 90% involving exceedance of the enterococci geometric mean criterion, fecal coliform densities were excluded from the following evaluation. The relationship between enterococci densities and environmental variables was the focus of the evaluation. Note that because enterococci density is log-normally distributed, enterococci densities were $\log_e$ transformed for this examination.

Table 11. Number of independent swimming season samples by continuous beach segment and year.

	Year						
Beach Segment (# Sample Stations)	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**Segment Totals**
CNSTBC (5)	0	128	80	181	140	150	679
CYPT (1)	33	23	33	30	28	30	177
FNTB (1)	39	22	15	30	28	28	162
FOUR (4)	0	93	0	123	68	87	371
GIB (3)	0	66	91	92	84	84	417
GISP (4)	135	91	128	122	38	84	598
HACK-RUTH (2)	0	53	32	67	47	29	228
HOLLY (6)	0	153	96	211	166	180	806
LCNB (1)	0	0	0	0	0	30	30
LCSB (1)	0	0	0	0	0	30	30
PONT (1)	28	0	0	28	27	28	111
Year Totals	235	629	475	884	626	760	3,609

The first step in evaluating the relationship between $\log_e$ enterococci density and the environmental variables was to examine the distribution of the environmental variables. The following four environmental variables each had a large number of categories and several categories with few observations: tide, weather, and wind direction and speed. Examination of the relationship between each of those variables and $\log_e$ enterococci indicated that in addition to being unsuitable for prediction due to a low number of observations in some categories, there was no clear pattern in the tide, weather, and wind direction data. Therefore, alternatives to these variables were developed.

To reduce the number of categories for those variables and eliminate categories with few observations, new variables were created from each of the original variables as follows. The nine Tide categories of high, high falling, low, low falling, normal, high rising, low rising, extremely low, and extremely high, were used to create a new variable, TideHNL, consisting of three categories: high, normal and low. Similarly, the eight Weather categories of clear, scattered clouds, partly cloudy, cloudy, mist, fog, light rain, and rain were used to create the new variable, Sunny, which has two categories: clear conditions (Sunny = 1) and other (Sunny = 0). WindDirection has 18 categories: 16 cardinal directions plus calm and variable. WindDirNSEW consists of five categories, reducing the 18 WindDirection categories into N, S, E, W and calm. Wind speed consists of six categories; 0 mph, plus five categories of 5 mph increments starting at 0-5 mph. For this analysis, the original wind speed variable was transformed to a continuous variable, as.numeric(WindSpeed). Because a number of the environmental variables were expected to be highly correlated, the interrelationship among variables was examined using variable clustering in order to avoid putting collinear variables in a single model together.

The next step in the process of modeling the relationship between $\log_e$ enterococci and environmental variables was selection of candidate variables. As noted above, four of the collected variables, tide, weather, and wind direction and speed, were replaced by TideHNL, Sunny, WindDirNSEW, and as.numeric(WindSpeed), respectively. To identify candidate variables for modeling, the relative influence of the environmental variables on $\log_e$ enterococci densities was estimated using the adjusted (for degrees of freedom) square of Spearman's *rho* rank correlation, generalized to fit *x* ($\log_e$ enterococci densities) non-monotonically to *y* (environmental factors). The results of that analysis were plotted for each continuous beach segment in Figures 7-16, and summarized in Table 12. Larger values of rho^2 indicate that changes in the environmental variable were more closely associated with changes in indicator organism density. Sample size (N) and the degrees of freedom (df), which equals 1 for continuous variables such as salinity and one minus the number of categories for categorical variables such as WindDirNSEW, are provided on the right side of Figures 7-16.

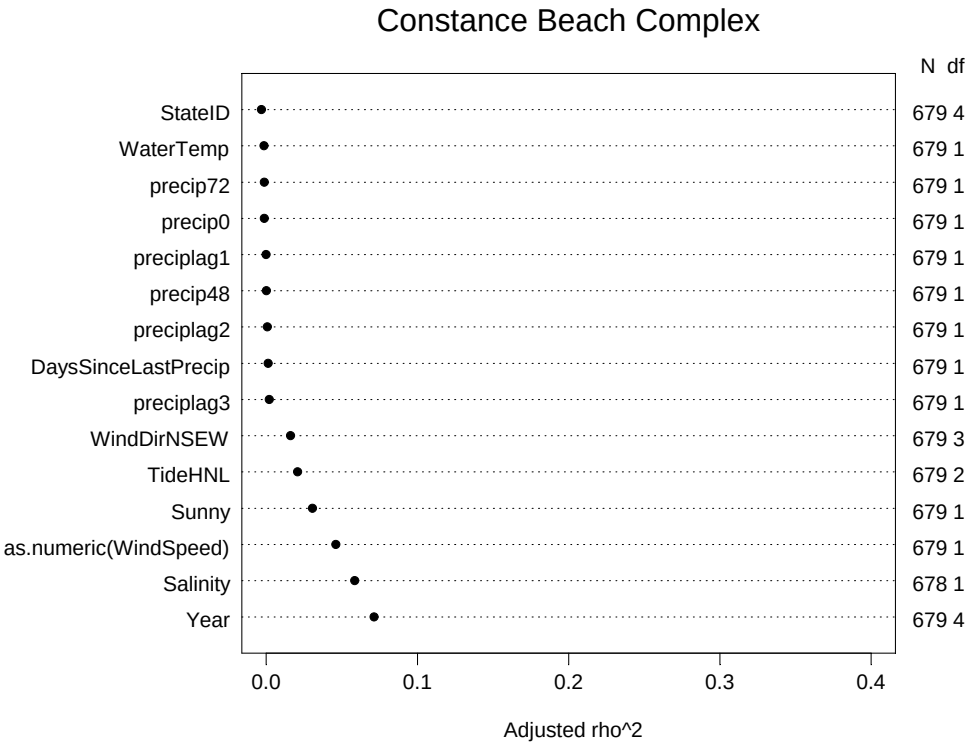

Figure 7. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2009 data from all Constance Beach Complex sample stations.

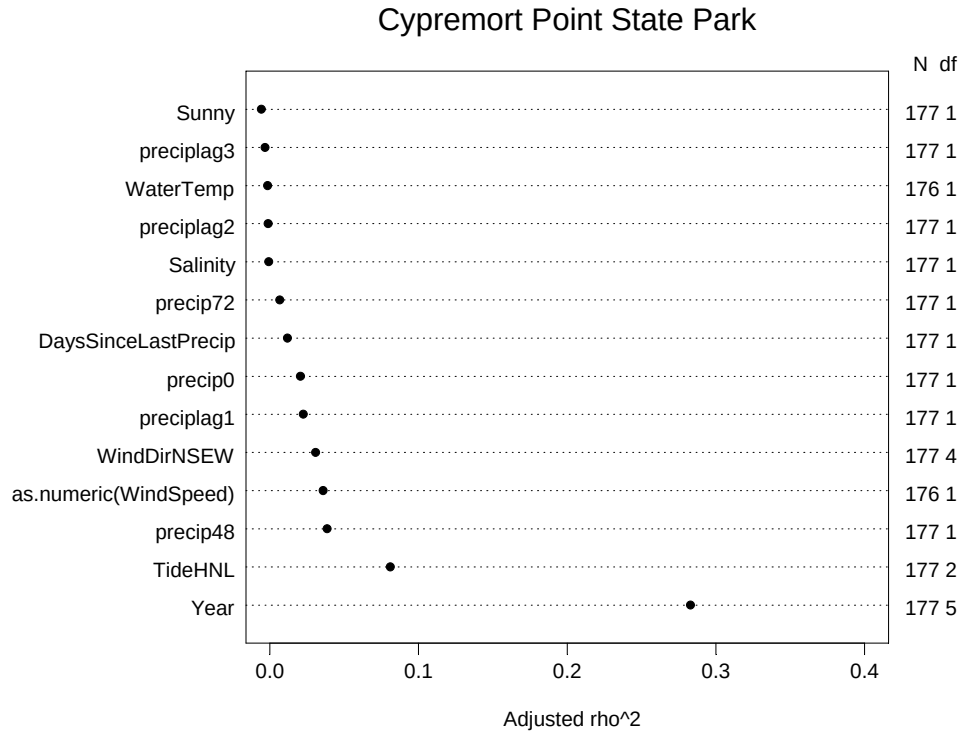

Figure 8. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2004-2009 data from the Cypremort Point State Park sample station.

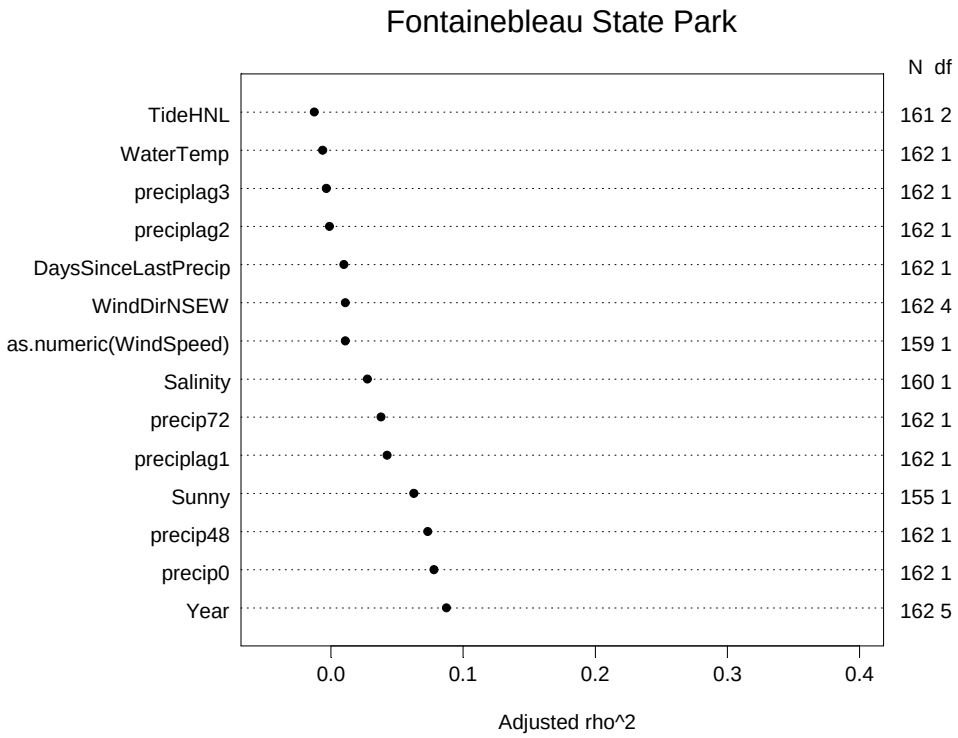

Figure 9. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2004-2009 data from the Fontainebleau State Park sample station.

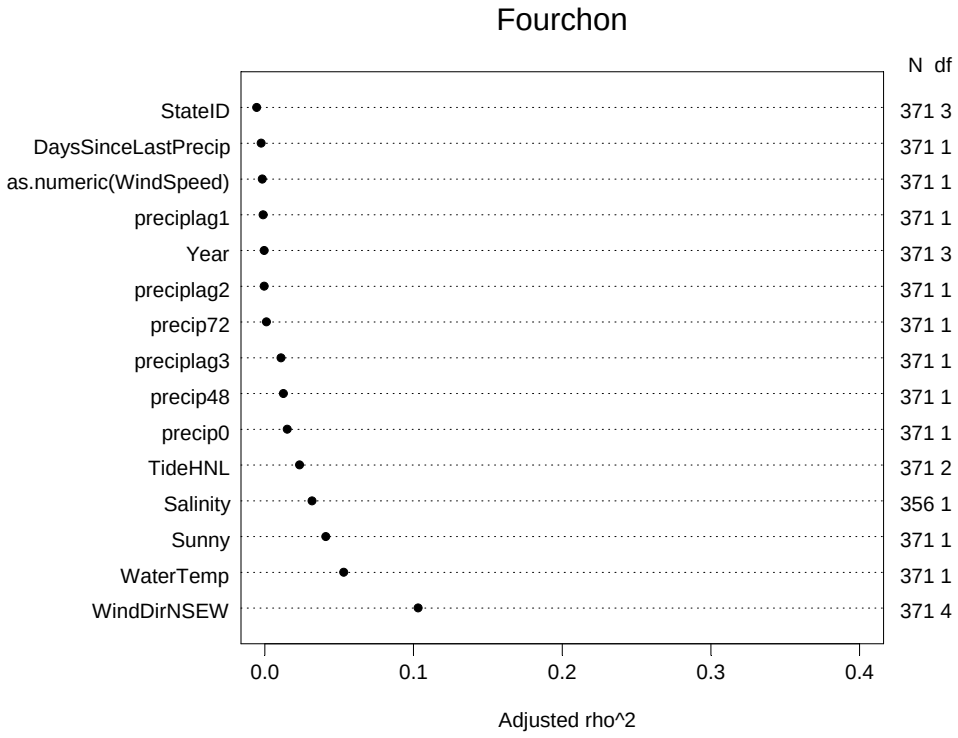

Figure 10. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005, and 2007-2009 data from all Fourchon Beach sample stations.

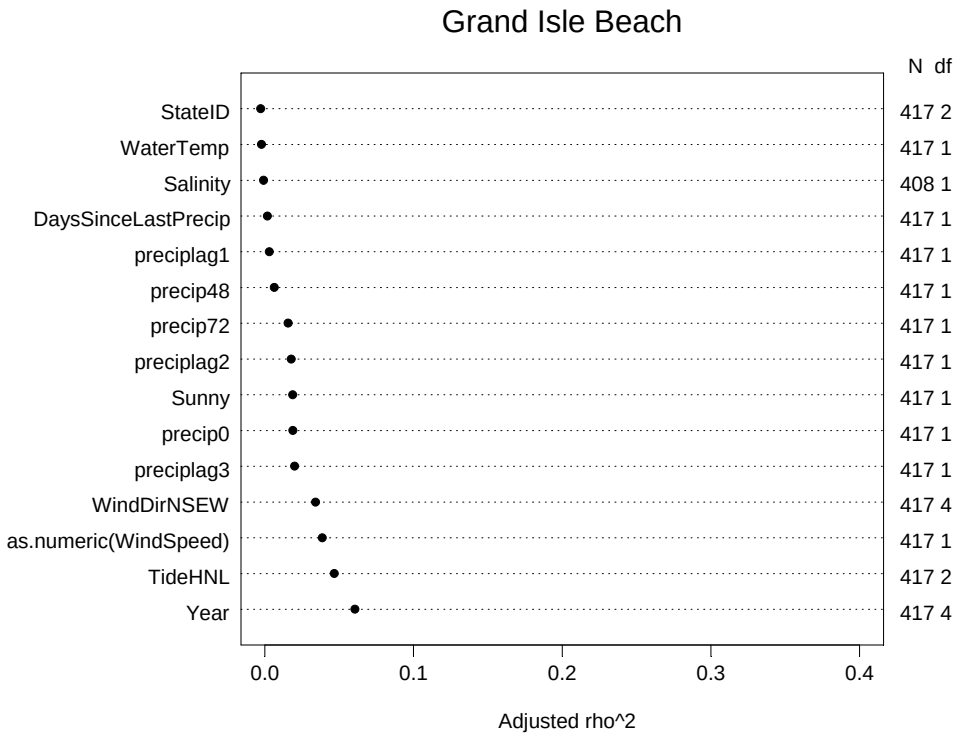

Figure 11. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2009 data from all Grand Isle Beach sample stations.

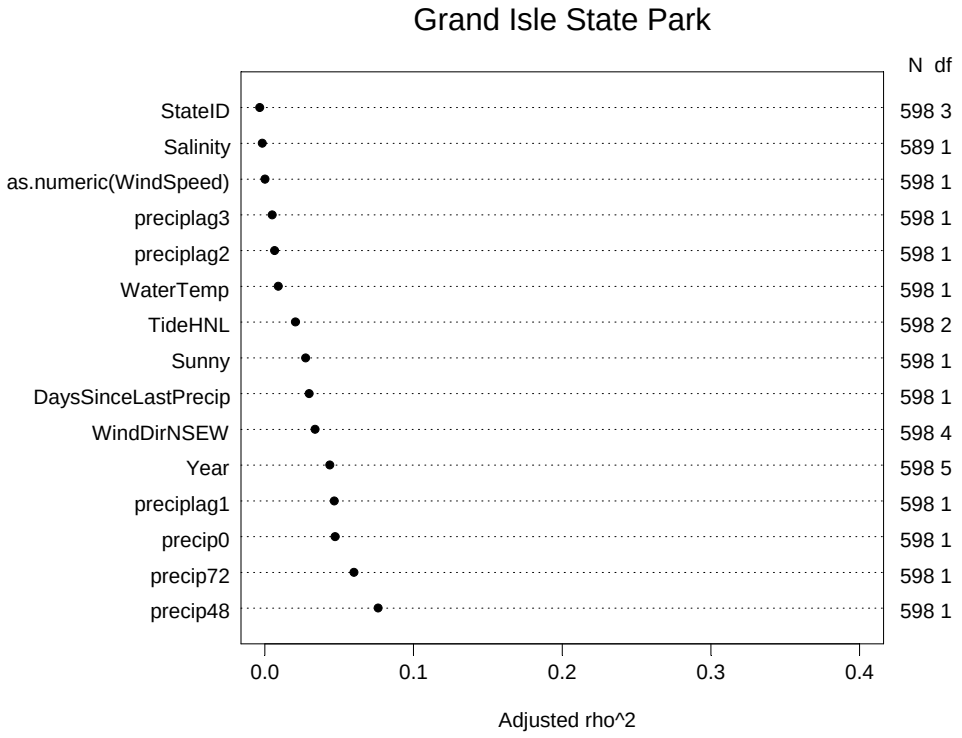

Figure 12. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2004-2009 data from all Grand Isle State Park sample stations.

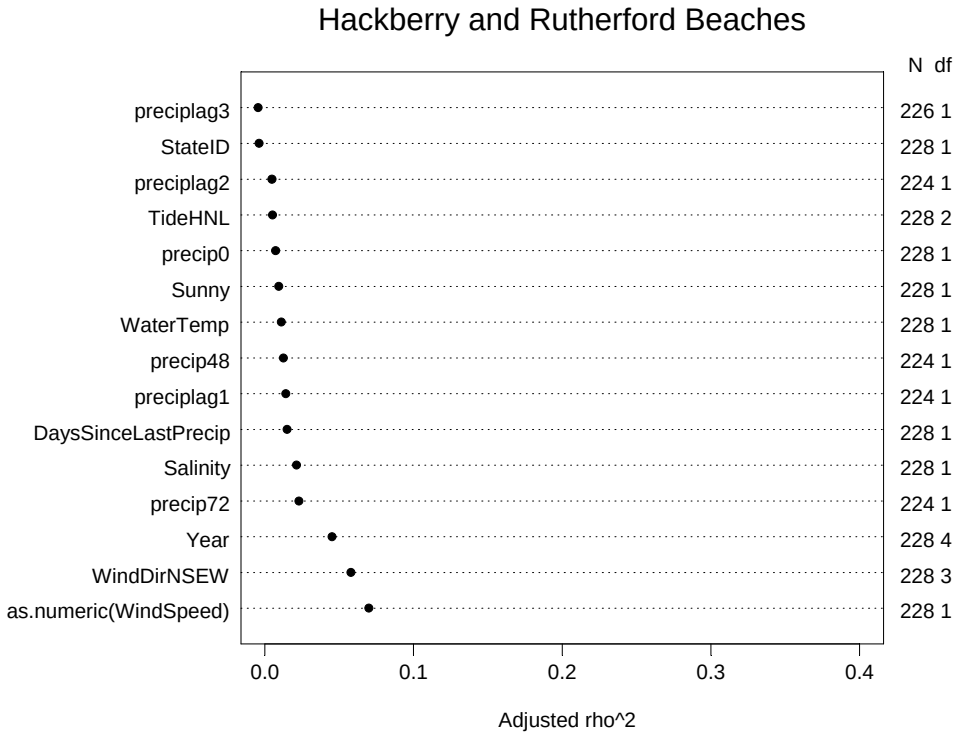

Figure 13. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2009 data from Hackberry and Rutherford Beach sample stations.

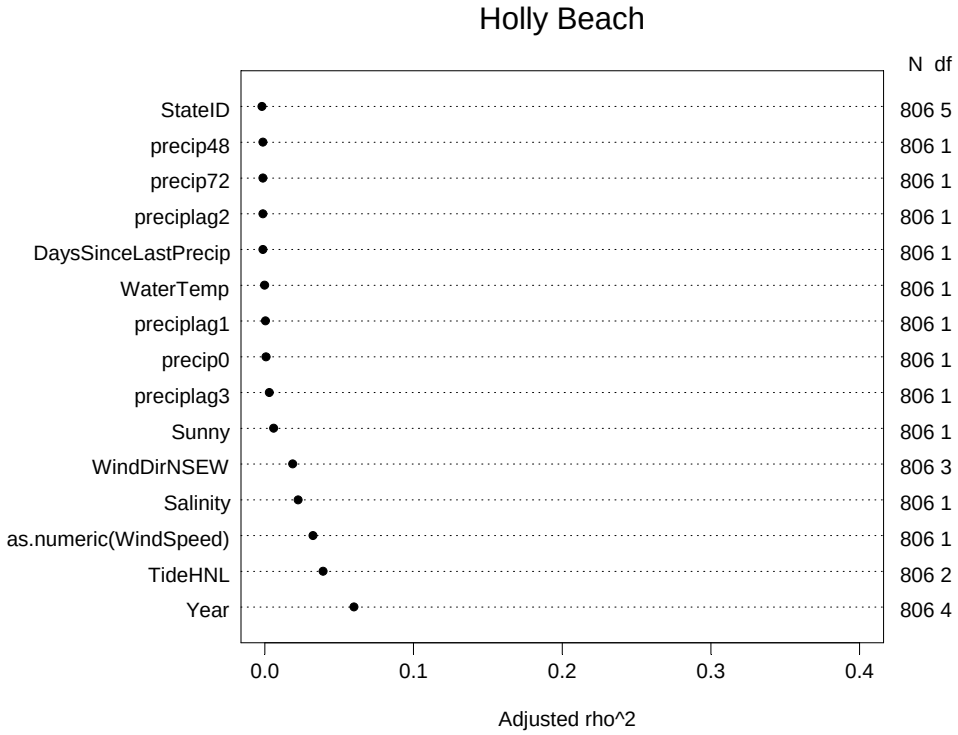

Figure 14. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2009 data from all Holly Beach sample stations.

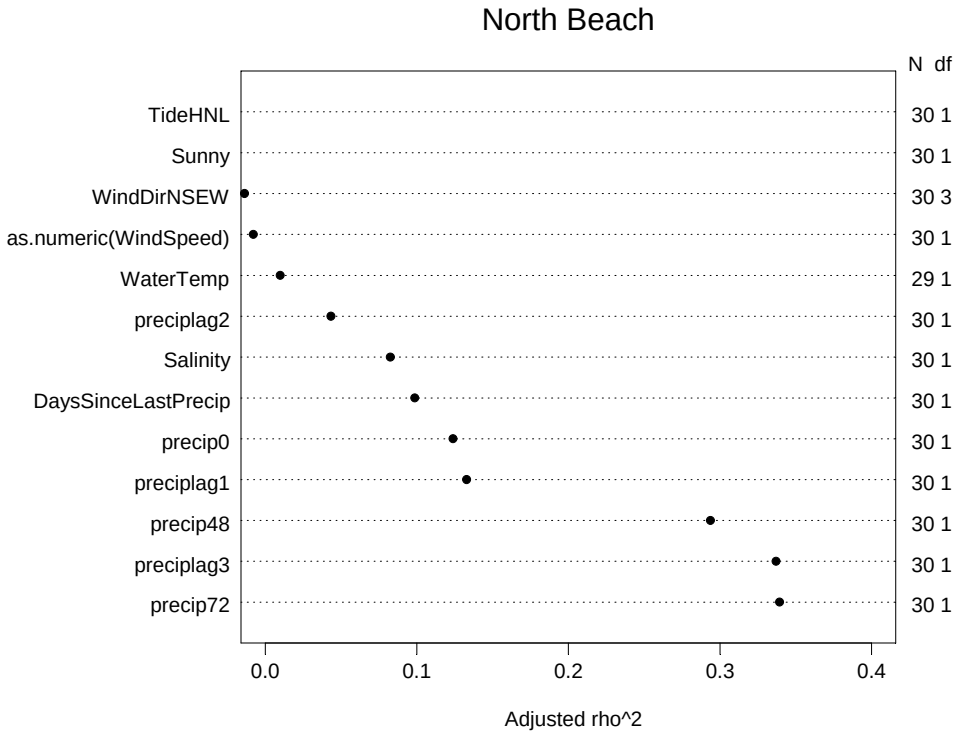

Figure 15. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2009 data from the North Beach sample station.

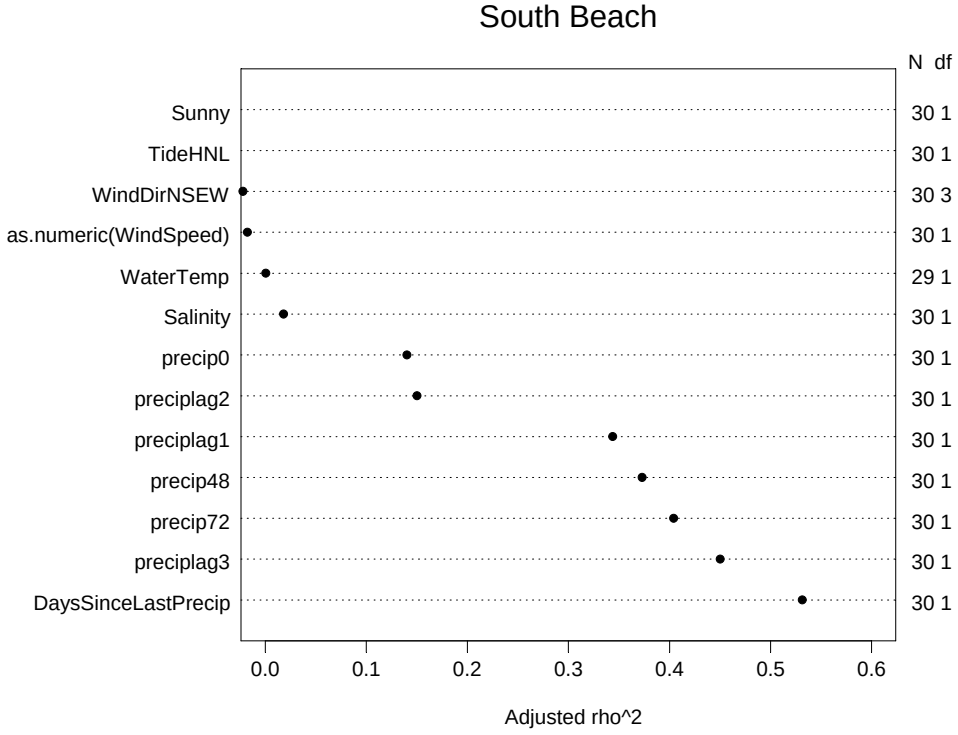

Figure 16. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2009 data from the South Beach sample station.

By reviewing Table 12, it is clear that there were no statistically meaningful differences among sample stations within continuous beach segments (StateID explains almost none of the variation in enterococci density), and that enterococci densities have changed from year to year (Year) at all beach segments except FOUR, which has remained stable (Figure 17).

Table 12. Influence of environmental factors on enterococci densities by continuous beach segment based on Spearman's adjusted rho^2 (2004–09).

				Environmental Variable (d.f.)													
Continuous Beach Segment	**# of Beach Stations**	**StateID (categorical)**	**Year (categorical)**	**TideHNL (2)**	**Sunny (1)**	**Wind Dir. NSEW (4)**	**as.numeric.Wind Speed (1)**	**Water Temp. (1)**	**Salinity (1)**	**precip0 (1)**	**preciplag1 (1)**	**preciplag2 (1)**	**preciplag3 (1)**	**precip48 (1)**	**precip72 (1)**	**DaysSinceLastRain (1)**	**rho^2 of best env. variable**
FNTB	1	NA	*		*				-	*	-			*	-		0.08
CYPT	1	NA	**	*			-			-	-			-			0.08
GISP	4		-	-	-	-		-		-	-	-	-	*	*	-	0.08
GIB	3		*	-	-	-	-			-		-	-		-		0.05
FOUR	4			-	-	**		*	-	-			-	-			0.10
Grand Isle Area Group	11	-	-	-	-	-		-		-	-	-	-	-	-	-	0.04
LCNB	1	NA	NA							**	**	**	**	**	**	**	0.53
LCSB	1	NA	NA							**	**		**	**	**		0.34
Lake Charles Group	2	NA	NA						*	**	**	**	**	**	**	**	0.41
HACK/RUTH	2		-			*	*		-		-				-	-	0.07
HOLLY	6		*	-	-	-	-		-								0.04
CNSTBC	5		*	-	-	-	-		*								0.06
Cameron Parish Group	13		*	-	-	-	-		-		-		-				0.04

Notes: All marks indicate that there is good evidence ($P < 0.05$) that enterococci density is influenced by the environmental variable, and "-" indicates that the variable explains < 5% of the observed variation, * indicates that the variable explains at least 5% but < 10% of the observed variation, and ** indicates that the variable explains at least 10% of the observed variation.

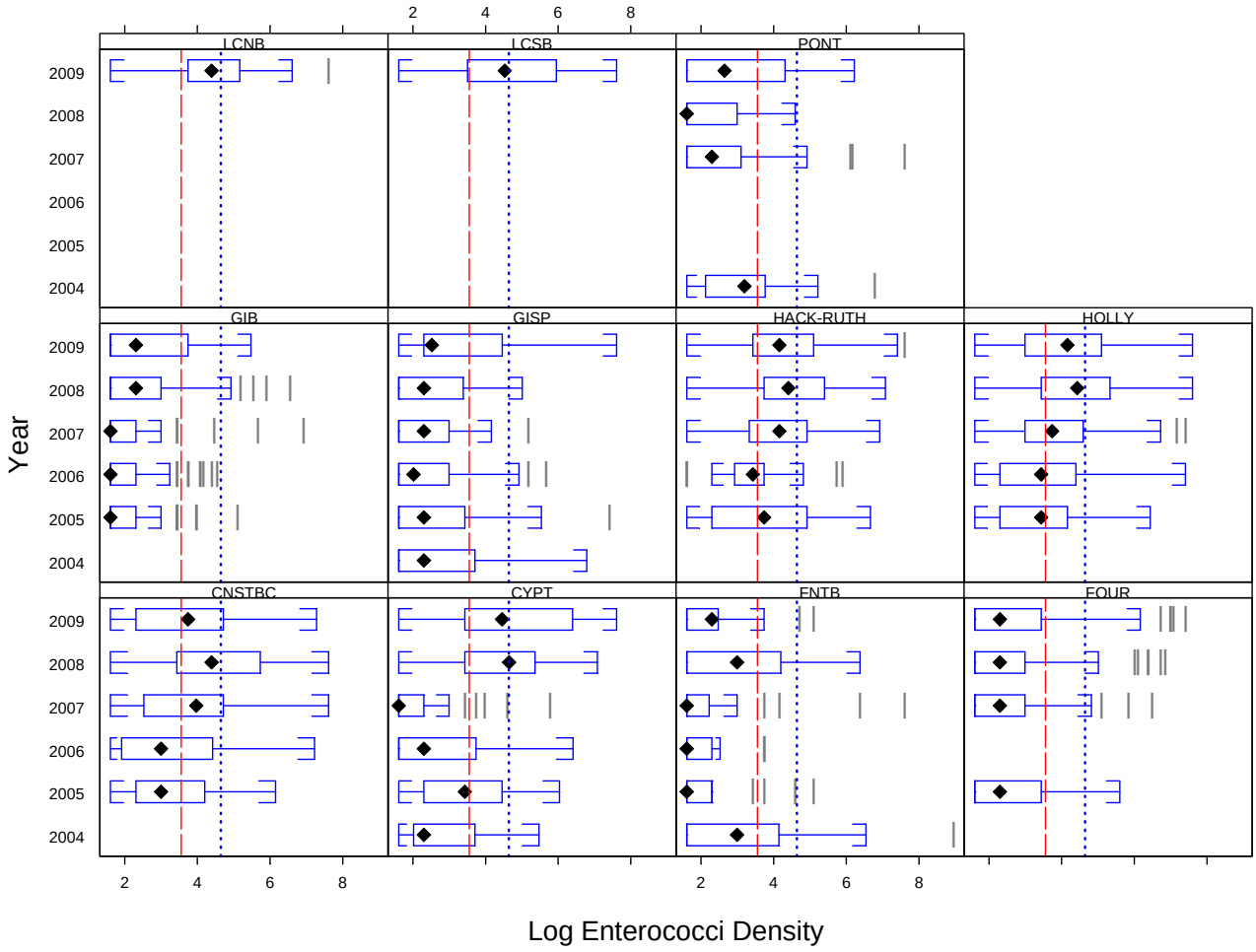

Figure 17. Distribution of $\log_e$ enterococci densities by year within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

Because there were substantial differences among years and those year effects were not of interest in the analysis of environmental variables, mixed effects analysis of variance was used. Mixed effects analysis of variance allowed the modeling of Year and StateID or Beach Segment as random rather than fixed effects. Treating the non-environmental variables as random effects removes the variability associated with those variables, improving the model's ability (i.e., power) to detect associations between enterococci density and the environmental variables of interest. Using the candidate variables for each continuous beach segment and area group, a set of competing models was developed. Because none of the environmental variables explained more than a small fraction (<10%) of the variability in enterococci density for all beach segments except for North and South Beaches (see Table 12), multivariable models were developed. The competing models for each segment/area group included the fullest set of uncorrelated candidate variables. For example, two competing full models were developed for FNTB to identify which precipitation variable best fit the data (i.e., $\log_e$ enterococci ~ Sunny + Salinity + precip0, or $\log_e$ enterococci ~ Sunny + Salinity + precip48), and then plausible reduced models were developed

to eliminate unnecessary variables. The most parsimonious model that best fit the observed data ("best model") was chosen using AIC (Burnham and Anderson 1998; Venables and Ripley 2002). The variables that remained in the best model for each continuous beach segment and beach area group are provided in Table 13.

Table 13. Environmental variables and R^2 values for each continuous beach segment's and area group's best model. "*" indicates that the environmental variable was in the final model.

Continuous Beach Segment	# of Beach Stations	Year Random	StateID/Beach Seg. Random	Environmental Variable											Best Model ~Env. Var. R^2	Best Model ~ Model R^2
				TideHNL	Sunny	Wind Dir. NSEW	numeric Wind Speed	Wind Dir. NSEW * Wind Speed Interaction	Water Temp.	Salinity	precip0	preciplag1	precip48	precip72		
FNTB	1	R	NA		S<C								+		17%	20%
CYPT	1	R	NA	H,L>N			+				+				13%	32%
GISP	4	R		H>N>L	S<C	W>C,N,S>E								+	13%	17%
GIB	3	R		H>N,L	S<C	W>C,N,S,E	+								11%	15%
FOUR	4			H,N>L	S<C	W>S>C,N>E				+					26%	26%
Grand Isle Group	11	R		H>N,L	S<C	W>C,N,S>E			+	+				+	19%	23%
North Beach	1	NA	NA											+	48%	48%
South Beach	1	NA	NA										+		47%	47%
Lake Charles Group	2	NA	R							+				+	44%	44%
HACK-RUTH	2	R				W>N,S,E	+							-	17%	18%
HOLLY	6	R		H,N>L		*[1]	+	*[1]		-					13%	16%
CNSTBC	5	R		H,N>L	S<C					-					14%	19%
Cameron Group	13	R		H,N>L		*[1]	+	*[1]		-		-			12%	16%

Notes: R indicates that the variable was modeled as a random effect ; NA = Not Applicable; Under Sunny, S=Sunny, C=Cloudy; Under WindDirNSEW, C=calm, N=North, S=south, E=East, W=west; ">" indicates that enterococci density is predicted to be lower under the conditions right of the symbol; "+" indicates a positive correlation between the variable and enterococci density; "-" indicates a negative correlation between the variable and enterococci density; *1 indicates that the increase in enterococci density with wind speed is W>N>E,S.

Note that two R^2 values are provided in Table 13: the Best Model ~ Model R^2 is the fraction of the total variability in the data that is explained by the model, including the random effects of Year and/or StateID/BeachSeg; and the Best Model ~ Env. Var. R^2 is the fraction of the total variability that is explained by the environmental variables alone, and is the metric of primary interest. Based on the R^2 values, the environmental variables in the best model for each continuous beach segment and area group, except for Lake Charles' beaches, explained only a small fraction of the total variability in indicator organism density. Thus, those models are not sufficient to be used as predictive models upon which precautionary advisories could be based. They do however provide insight into the environmental factors that influence enterococci

density. Although the Lake Charles models explained a much larger fraction of the total variability than the models for the other beach segments, it is important to remember that the Lake Charles models are based on one year's sample of 30 observations for each beach. Data from additional years will be required to determine the potential to model and predict water quality for the Lake Charles beaches.

The relationship between $\log_e$ enterococci density and each model variable is summarized in Table 13 and presented graphically in Figures 16-25. Note that only precip72 is presented graphically although other precipitation variables were modeled. Precip72 was selected for plotting because it was the most frequent best model precipitation variable, and, due to the high correlation among precipitation variables, graphs of precip72 are comparable to those of the other precipitation variables, differing primarily in scale. Descriptions of model results for each beach follow.

Fontainebleau State Park

Model results for FNTB indicate that the environmental variables precip48 and Sunny were most influential, with the lowest enterococci density predicted under sunny conditions and no rain within 48 hours prior to sample collection. The highest densities were predicted to occur under cloudy conditions with high amounts of precipitation 48 hours prior to sample collection.

Cypremort State Park

Enterococci density at CYPT was influenced by precip0, TideHNL, and WindSpeed. The lowest enterococci densities were predicted under normal tides, calm winds, and no precipitation within 24 hours prior to sample collection. The highest densities were predicted to occur when tides are high, winds are strong and it had rained within 24 hours prior to sample collection.

Grand Isle State Park

For GISP, TideHNL, precip72, WindDirNSEW, and Sunny were the most influential environmental factors, with the best water quality predicted under low tides, east winds, sunny skies, and no rain within 72 hours prior to sample collection. The poorest water quality was predicted with high tides, west winds, cloudy skies and precipitation within 72 hours prior to sample collection.

Grand Isle Beach

TideHNL, WindDirNSEW, WindSpeed and Sunny were the influential environmental variables for GIB. The lowest enterococci density was predicted when tides were normal or low, wind speed was low and not from the west, and skies were sunny. Water quality was predicted to be poorest at high tide, with strong west winds, and cloudy skies.

Fourchon Beach

Model results for FOUR indicate that TideHNL, Sunny, WindDirNSEW, and Salinity were influential. The best water quality conditions were predicted when tides were low, skies were sunny, there was an east wind, and salinity was low. Poorest water quality was expected when tides were normal or high, skies were cloudy, west winds were blowing, and salinity was high.

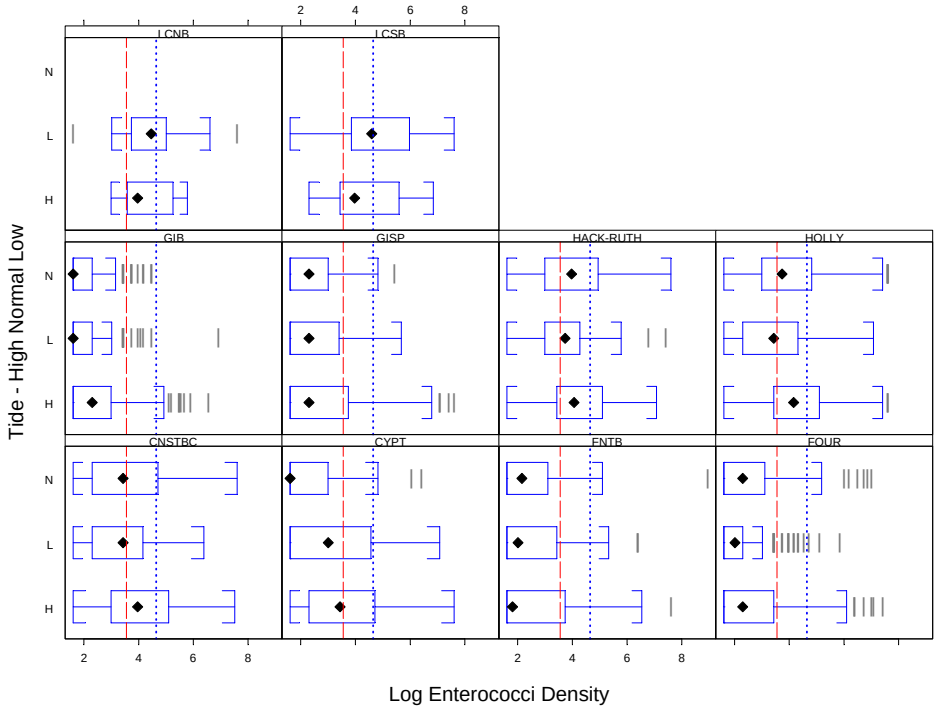

Figure 18. Distribution of $\log_e$ enterococci densities by tide (H=high, L=low, and N=normal) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

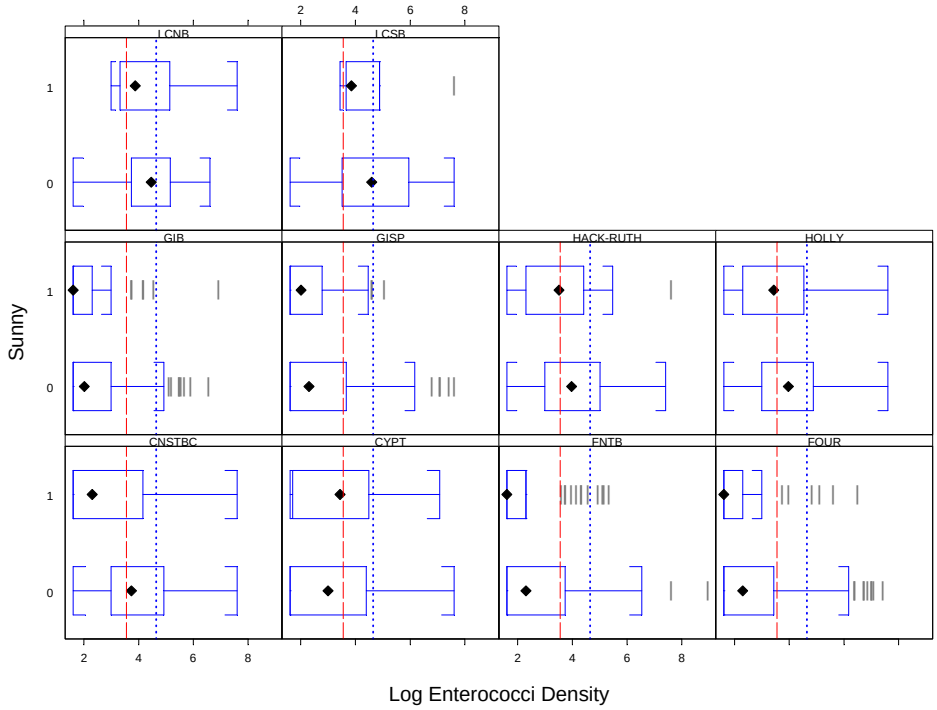

Figure 19. Distribution of $\log_e$ enterococci densities by cloudy (Sunny=0) and sunny (Sunny=1) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

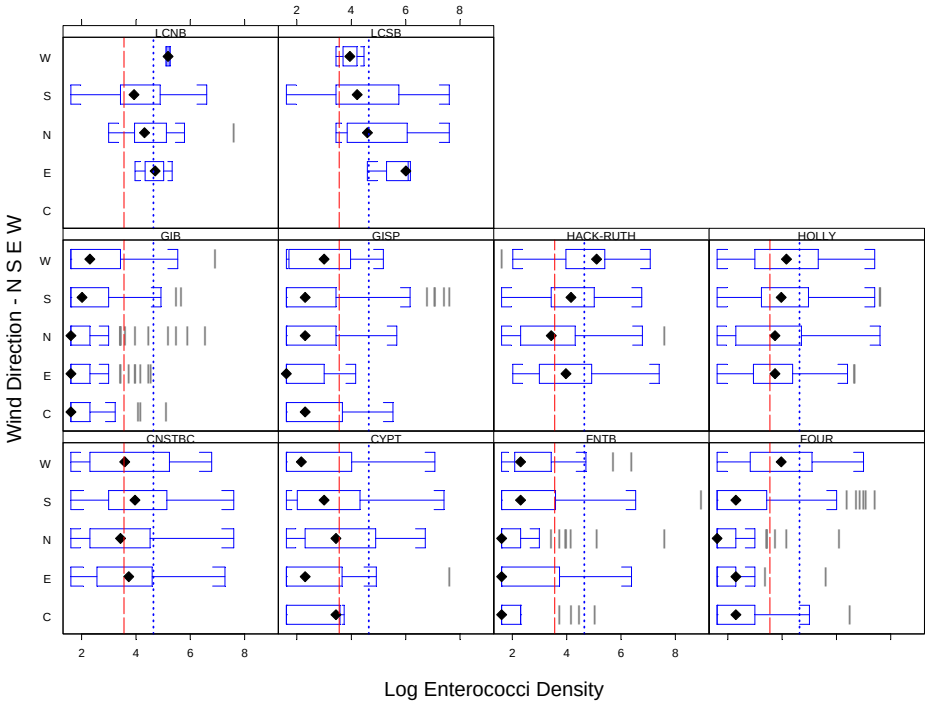

Figure 20. Distribution of $\log_e$ enterococci densities by wind direction (C=calm, E=east, N=north, S=south, W=west) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

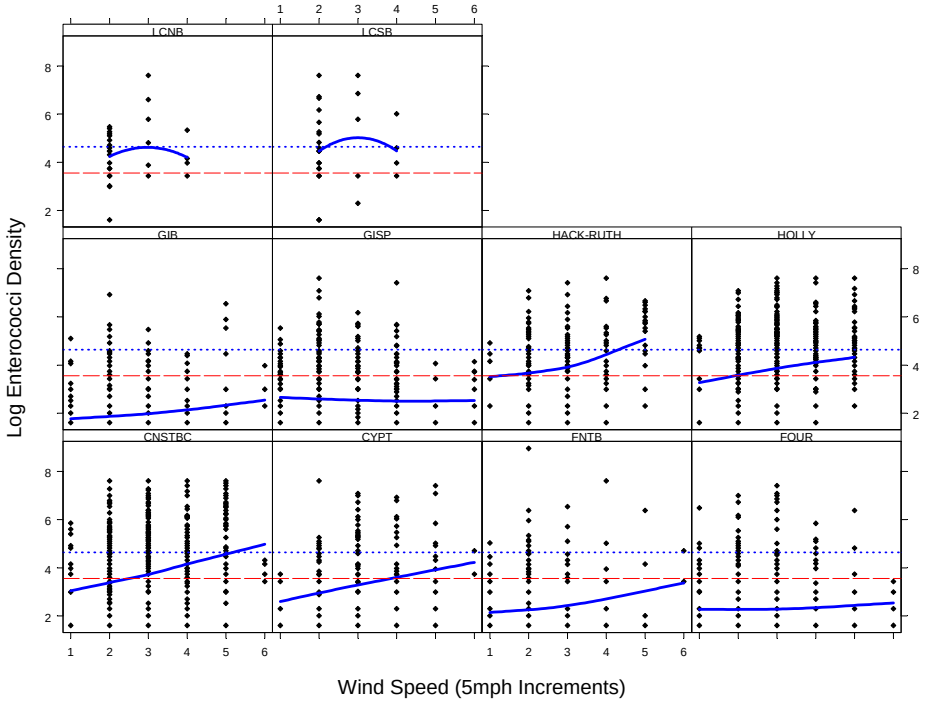

Figure 21. Relationship between $\log_e$ enterococci densities and wind speed shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines). Wind speed 1 = calm winds, 2 = 0-5mph, and 3-6 increase in increments of 5mph from category 2.

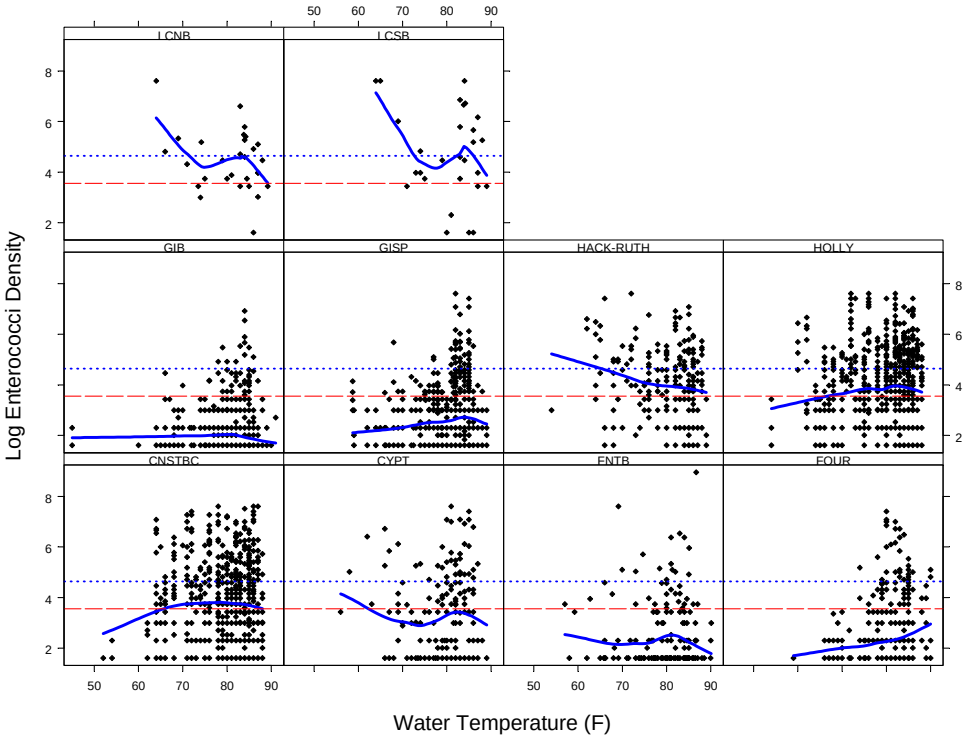

Figure 22. Relationship between $\log_e$ enterococci densities and surface water temperature shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

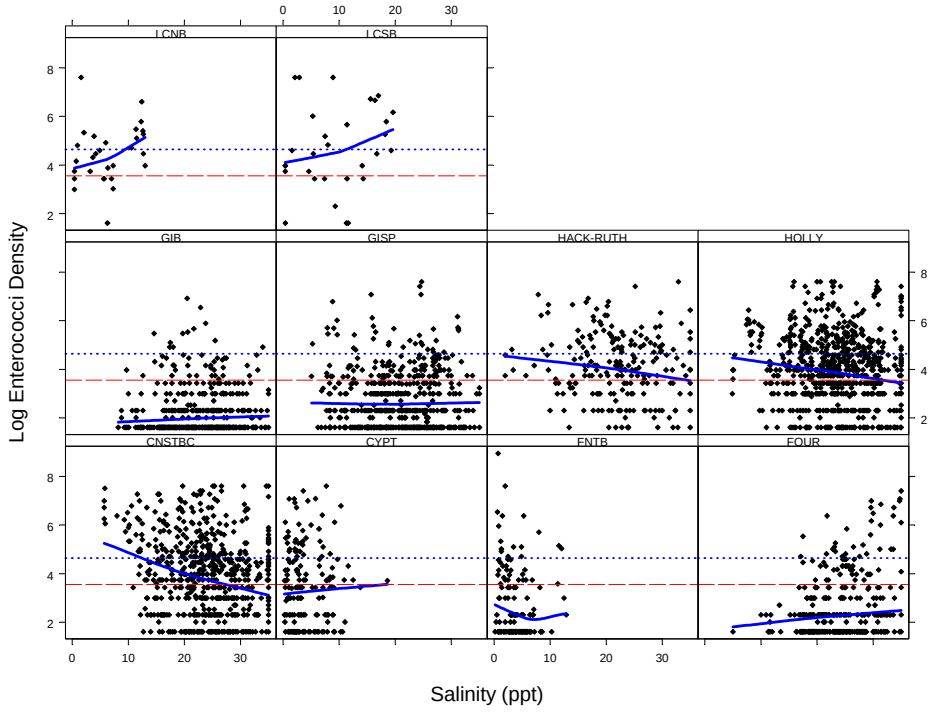

Figure 23. Relationship between $\log_e$ enterococci densities and salinity shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

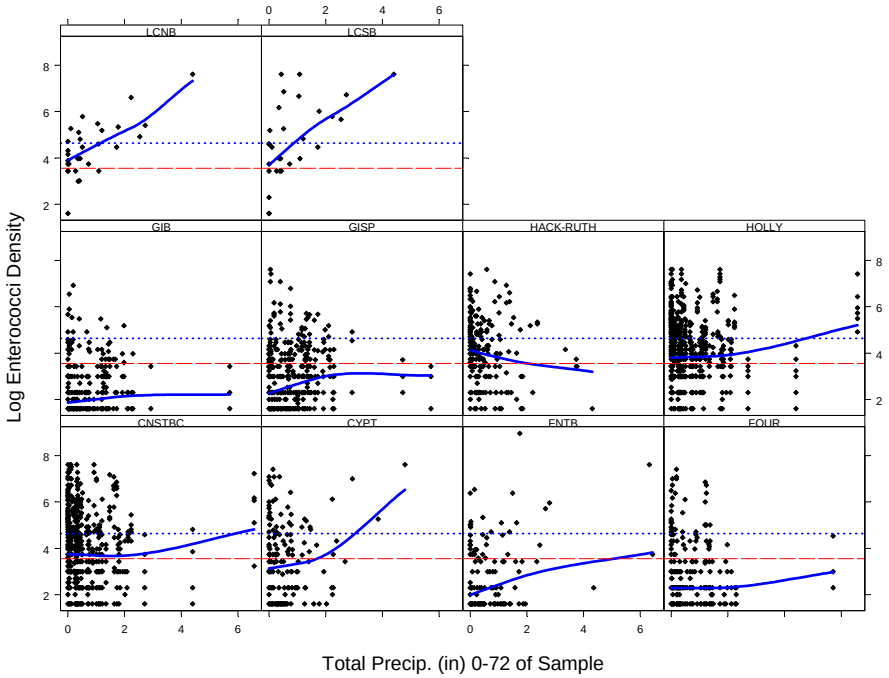

Figure 24. Relationship between $\log_e$ enterococci densities and precip48 shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

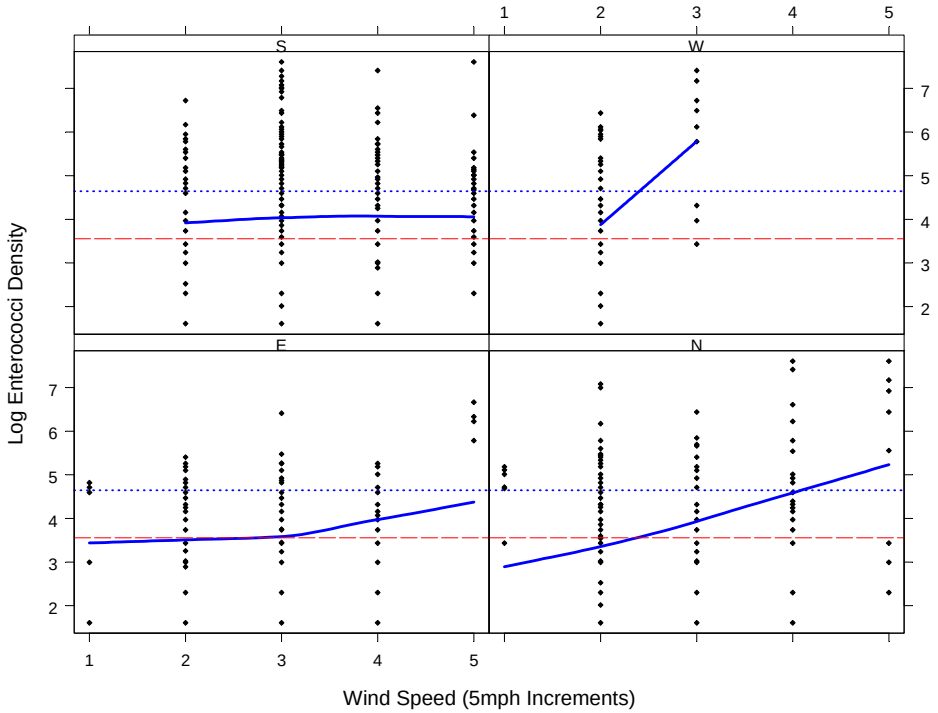

Figure 25. Interaction between wind direction (E, N, S, W) and wind speed on $\log_e$ enterococci density for HOLLY shown as a loess line (solid blue line) relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines). Wind speed 1 = calm winds, 2-5 are 5mph increments from 0 (category 2=0-5mph).

Grand Isle Area Group

The Grand Isle Area Group model indicates that water quality for the region was influenced primarily by WindDirNSEW, TideHNL, Sunny, and to a lesser extent, precip72, Salinity and WaterTemp, with the best water quality predicted under east winds, normal or low tides, sunny skies, no rain within the last 72 hours, and low salinity. Water quality was predicted to be of lower quality under west winds, high tides, cloudy skies, high salinity, and substantial rain within the last 72 hours.

Lake Charles Beaches

North and South Beaches individually and combined as the Lake Charles Area Group were influenced primarily by cumulative rainfall within 48-72 hours, with enterococci density increasing with increasing precipitation. To a lesser extent, Salinity may also have influenced enterococci density, with poorer water quality expected at higher salinities. Those results should be considered as preliminary because the models are based on a relatively small number of samples collected in only one year.

Hackberry and Rutherford Beaches

The model for HACK-RUTH indicated that WindDirNSEW, WindSpeed and precip72 influenced enterococci density. The best water quality was expected with calm winds and a high amount of rain during the prior 72 hours. The poorest water quality was expected with higher wind speed, especially when from the west, and no rain during the prior 72 hours.

Holly Beach

Enterococci density at HOLLY was influenced by WindDirNSEW and WindSpeed, and their interaction, TideHNL, and Salinity. Water quality was expected to be best when wind speed and tides were low and salinity was high. Poorer water quality was expected when strong west or north winds were blowing, tides were high or normal, and salinity was low.

Constance Beach Complex

At CNSTBC, enterococci density was influenced by the environmental variables TideHNL, Sunny and Salinity, with the best water quality predicted to occur when salinity and tides were low, and skies were sunny. Poorest water quality was predicted to occur when salinity was low, tides were high or normal, and skies were cloudy.

Cameron Parish Area Group

The regional model for the Cameron Parish area group, which included HACK-RUTH, HOLLY and CNSTBC, identified WindDirNSEW and WindSpeed, and their interaction, TideHNL, Salinity, and preciplag1as the influential environmental variables. Regional water quality was predicted to be best when salinity was high, winds were calm, tides were low, and it had rained in the past 24-48 hours. The poorest water quality for the region was predicted when salinity was low, strong west or north winds were blowing, tides were high or normal, and there had been no rain in the past 24-48 hours. The Cameron Parish area group model was, like those for the associated beach segments, inadequate to explain the persistently high enterococci densities observed at the Cameron Parish beaches. LDHH and LDEQ staffs, in consultation with EPA, identified several hypotheses as to the cause of the high enterococci densities observed at Cameron Parish beaches. Those hypotheses were examined in 2008 and 2009 and rejected. The

remaining untested hypothesis is that unique edaphic factors along the Cameron Parish coastline allow a high enterococci density to persist in beach sands. The statistical models of environmental variables and indicator organism densities, though inadequate to explain the observed high densities, do tend to support the beach sands hypothesis. Cameron Parish beaches have the only Louisiana BEACH Program stations with a large, semi-contained intermediate salinity marsh behind the natural levee that forms the beach area. Byappanahalli et al. (2006) found that enterococci can occur and persist for extended periods in backshore sand at the groundwater table of freshwater beaches on Lake Michigan. It is however unknown whether indicator bacteria are commonly found in subsurface sand under different climatic (temperate, tropical/subtropical) and water (estuarine, marine) conditions, and if human pathogens (bacteria, viruses, protozoa) can similarly persist for extended periods in deep, subsurface sand. It is possible that water from the marsh is flowing through the natural levee and supplying nutrients that are otherwise limiting microbial growth in the marine sands. Lower salinity was found closer to the shore in a limited study conducted by LDEQ, supporting the hypothesis that water is flowing from the marsh into beach sands. However, further study is required to test this hypothesis, and more importantly, to determine if the beach sands have high enterococci densities.

In summary, given the available data, it is unlikely that models that can reliably predict enterococci densities can be developed for Louisiana's beaches. Different environmental factors are most correlated with enterococci density for different beach segments and area groups, and no single environmental factor is useful in predicting indicator organism density. It also appears that the relationship between environmental factors and enterococci density is complex and will take more investigation to understand, requiring targeted studies that are not funded under current Beach Grants. Better measurement of the environmental variables that are currently being collected and/or collection of additional environmental measures may be required to adequately predict water quality from observable environmental conditions. Louisiana beaches are somewhat different from those of most coastal states in that they represent a wide range of salinity conditions and most are relatively remote from urban runoff, reducing the direct association between environmental conditions and enterococci densities.

CHAPTER 4. Evaluation Of Program Performance Relative To Data Quality Objectives.

Louisiana's BEACH Program Quality Assurance Project Plan (LDHH 2009) states that at the end of each year, the Program Manager shall audit the Program to determine if the Program's data quality objectives are being met. As described in the QAPP (see Table A7.1 of the QAPP), the Program's data quality objectives for the parameters measured in accordance with the QAPP are expressed in terms of accuracy, precision, and completeness goals. Those data quality objectives are repeated below in Table 14, together with their 2009 results.

Table 14. Data quality objectives and 2009 results.

Parameter	Concen-tration Units	QAPP Precision Goals (RPD)	2009 Precision Mean RPD (± 1 SE, n)	QAPP Completeness Goals	2009 Completeness
Enterococci	MPN/ 100ml	Sample 60%; lab 30%	Sample 54.6% (±8.5, 39); lab 44.2% (±6.7, 42)	98%	100%
Fecal Coliform	MPN/ 100ml	Sample 60%; lab 30%	Sample 59.2% (±8.2, 39); lab 44.1% (±6.6, 42)	98%	100%
Salinity	ppt	Sample 10%, lab 5%	Sample 1.5% (±0.5, 39); lab 2.0% (±0.6, 42)	98%	100%
Surface Water Temperature	°F	$\pm$ 2°	$\pm$ 2° by SOP	98%	99.3%
Tide Conditions	NA	NA	NA	98%	100%
Weather	NA	NA	NA	98%	100%
Wind Direction	NA	NA	NA	98%	100%
Wind Speed	NA	NA	NA	98%	100%
Precipitation	Inches/ previous 24 hours	NA	NA	98%	100%
River Stage	Feet on flood gauge	NA	NA	98%	100%

To evaluate compliance with the established data quality objectives (DQOs) for sample and laboratory precision on estimated indicator organism densities and salinity, results from routine samples, calibration or resample events were compared to matching quality control sample results. Prior to the start of the monitoring period, approximately 10% of scheduled samples (routine and calibration samples) were designated as quality control samples. QC samples were selected at random at the beginning of the sampling period in approximately equal proportions (~ 5% each) of field duplicate and field split samples. QC samples were also collected during some resample events, which are also included in the QC evaluation. Sampling and laboratory precision were then estimated from each quality control sample by calculating the relative percent difference (*Sample RPD*) as follows:

$$Sample\ RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2}\ x\ 100$$

where C_1 is the routine sample (or resample) result and C_2 is the quality control sample result. To estimate precision across samples, the mean and standard deviation of Sample RPDs were calculated. Note that the precision goals are expressed as means, and compliance with precision goals is assessed by determining if the observed precision is statistically different from the goal.

During 2009, a total of 86 quality control samples were scheduled to be collected. The 86 scheduled quality control samples were to consist of 42 field duplicates and 44 field split samples. Thirty-six (36; 86%) field duplicates were sampled as scheduled and 39 (89%) field-split samples were collected as scheduled, resulting in 87% of scheduled QC samples collected. Four additional quality control samples were collected at the scheduled sample event, but were of the wrong type, bringing the total of scheduled QC samples collected to 92%. Two unscheduled QC samples were collected (2 field duplicate) in conjunction with routine sample events.

To evaluate compliance with QAPP precision goals, means and standard errors of sample RPDs were calculated for the 2009 QC samples and are presented in Table 14. Figures 26-28 show Sample RPD results relative to precision goals; if the lower error bar (lower 95th percentile) shown in the graph is below the goal, then the goal has been achieved. Precision goals were achieved for 2009 fecal coliform and enterococci field duplicates, and all salinity QC samples. However, as in 2008, QC goals for fecal coliform and enterococci field splits were not met although 2009 results were substantially better than those of the prior year. The field split sampling precision goal for fecal coliform and enterococci is 30% RPD but the observed lab RPD for fecal coliform and enterococci exceeded the goal by an estimated 47%.

Field splits were designed to estimate the variability of the analysis process plus any imprecision resulting from sample handling and transport. Field duplicates were designed to capture the same sources of variability as field splits plus variability associated with sampling a heterogeneous environment. Subtracting the estimated field split variability from the field duplicate variability provides an estimate of sampling error, or the expected difference in enterococci density estimates between different samples collected simultaneously at the same place. Accordingly, the RPD for field splits is expected to be less than the RPD for field duplicates. However, in 2008, this was not the case. Investigations into the possible case of this discrepancy during 2009 determined that some field samplers were not properly recording the type of QC sample collected, which could explain field split RPD being greater than field duplicate RPD in 2008 and failure to meet the goal in 2009. To ensure that the estimates of filed split and field duplicate precision for the 2010 season are accurate, prior to the start of the sampling period the BEACH Program Manager/Quality Assurance Officer will reinforce the need for: 1) proper data recordation, and 2) through mixing of field splits. If the 2010 field spilt precision goal is not meet, then the lab precision goals may need to be adjusted upward.

Completeness is the percentage of measurements made that are judged to be valid according to specific criteria and entered into the data management system. Percent completeness *(%*C) for measurement parameters was estimated as follows:

$$\%C = \frac{V}{T} \; x\,100$$

where *V* is the number of measurements judged valid and *T* is the total number of measurements. During 2009, all of the 841 samples collected were successfully processed and the results considered valid and recorded in the Program's database, except for 5 missing water temperature records. Accordingly, all completeness goals for 2009 were achieved.

In addition to the above audit, the BEACH Program Manager/Quality Assurance Officer verified throughout the 2009 sampling period that:

- All elements of the QAPP were being correctly implemented as prescribed except for the QC sample data recordation problem noted above;
- The quality of the data generated by implementation of the QAPP was adequate; and
- Corrective actions, when needed, were implemented in a timely manner and their effectiveness was confirmed.

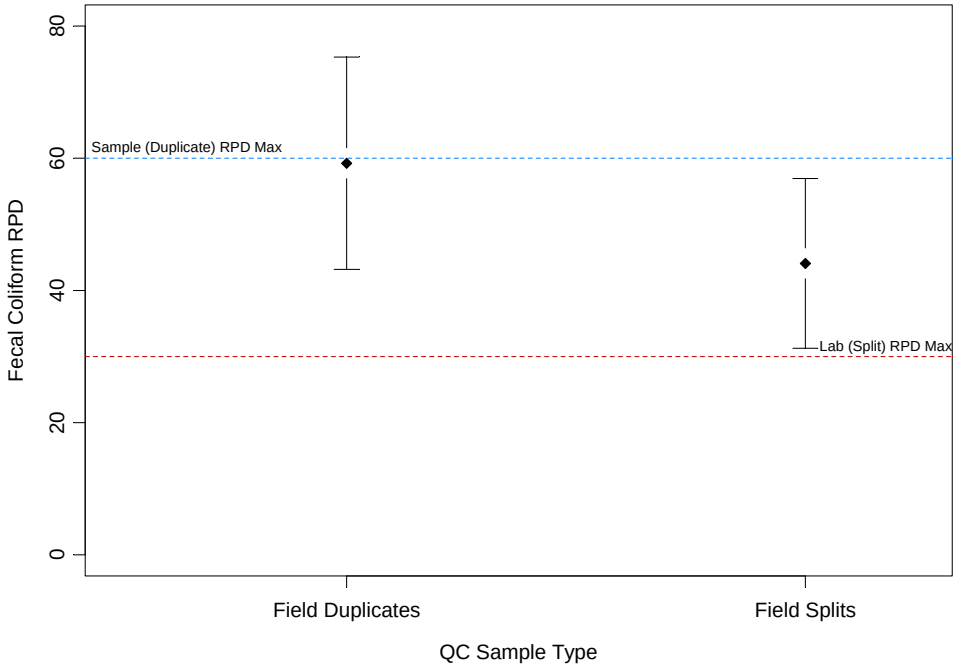

Figure 26. Comparison of 2009 monitoring season mean fecal coliform relative percent difference (RPD) for field duplicates and field splits with QAPP precision goals. Means are represented by diamonds, and upper and lower 95th percentiles of the mean are shown as error bars.

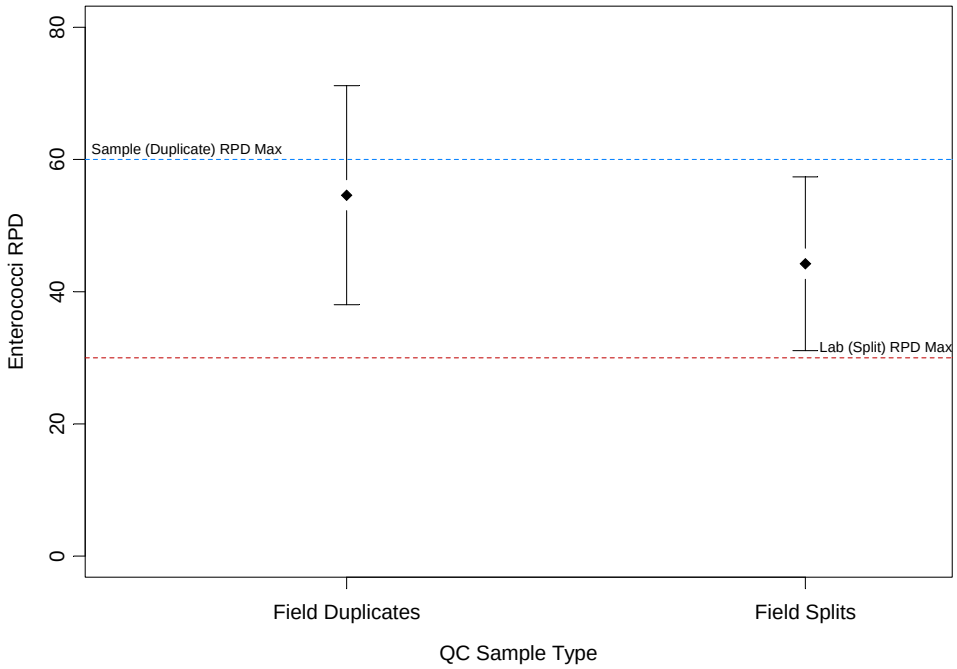

Figure 27. Comparison of 2009 monitoring season mean enterococci relative percent difference (RPD) for field duplicates and field splits with QAPP precision goals. Means are represented by diamonds, and upper and lower 95th percentiles of the mean are shown as error bars.

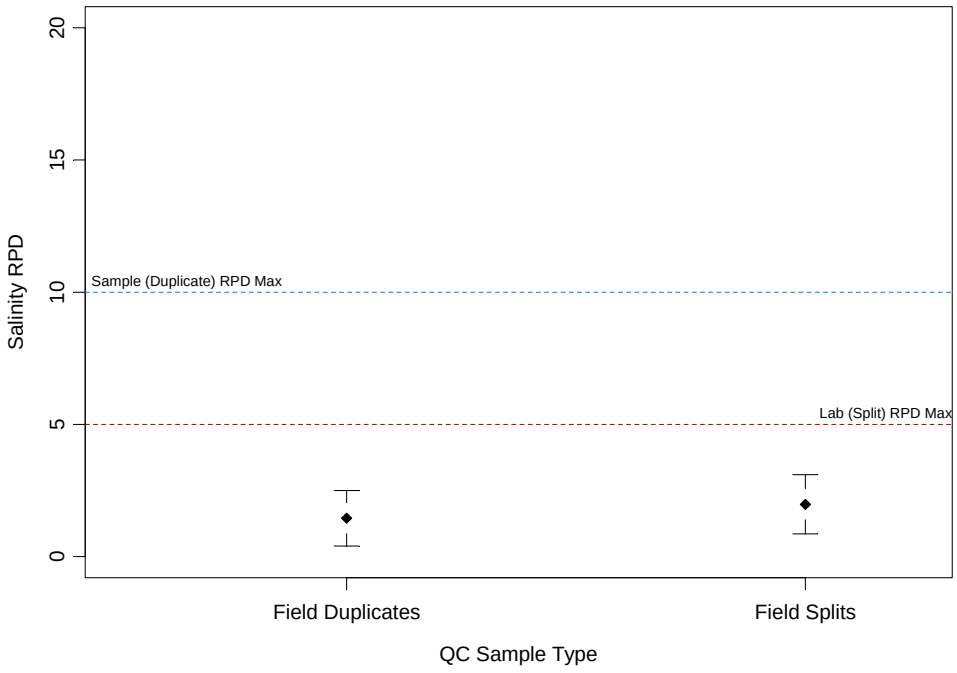

Figure 28. Comparison of 2009 monitoring season mean salinity relative percent difference (RPD) for field duplicates and field splits with QAPP precision goals. Means are represented by diamonds, and upper and lower 95th percentiles of the mean are shown as error bars.

No inconsistencies with the QAPP were detected during 2009 except for failure of the field sampler to properly record the type of QC sample collected for a small number of samples. The BEACH Program Manager/Quality Assurance Officer will reinforce the need for proper data recordation prior to the start of the 2010 sampling period. All monitoring and notification data collected during 2009 have been uploaded to EPA's BEACH (PRAWN) and STORET data systems via WQX submission of an XML formatted file.

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APPENDIX A

Sample Station Names and EPA IDs

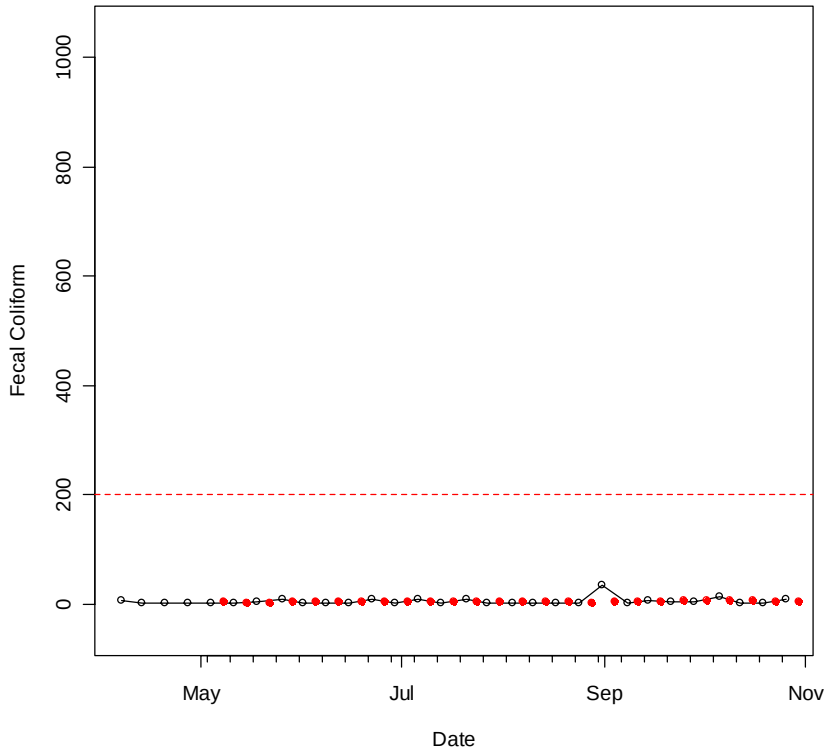
List of sample stations designated under the Louisiana BEACH Program by State ID, Beach Name, and USEPA IDs.

State ID	Beach Name	USEPA ID
CNST1	Constance Beach	LA134778
CYPT1	Cypremort Point State Park	LA971783
DUNG1	Long Beach	LA860482
FNTB1	Fontainebleau State Park	LA733869
FOUR1	Fourchon - 1	LA427986
FOUR2	Fourchon - 2	LA984228
FOUR3	Fourchon - 3	LA677480
FOUR4	Fourchon - 4	LA452669
GBRZ1	Gulf Breeze	LA725358
GIB1	Grand Isle Beach - 1	LA430483
GIB2	Grand Isle Beach - 2	LA325065
GIB3	Grand Isle Beach - 3	LA799656
GISP1	Grand Isle State Park - 1	LA240078
GISP2	Grand Isle State Park - 2	LA221569
GISP3	Grand Isle State Park - 3	LA204303
GISP4	Grand Isle State Park - 4	LA186192
HACK1	Hackberry Beach	LA720012
HOLLY1	Holly Beach - 1	LA489985
HOLLY2	Holly Beach - 2	LA829030
HOLLY3	Holly Beach - 3	LA109442
HOLLY4	Holly Beach - 4	LA697221
HOLLY5	Holly Beach - 5	LA164373
HOLLY6	Holly Beach - 6	LA467180
LCNB1	North Beach	LA202517
LCSB1	South Beach and Rabbit Island	LA981443
LTFL1	Little Florida	LA595220
MART1	Martin Beach	LA135245
PONT1	Pontchartrain Beach	LA960851
RUTH1	Rutherford Beach	LA284049

APPENDIX B

Time Series of Water Quality Results By Sample Station

A



B

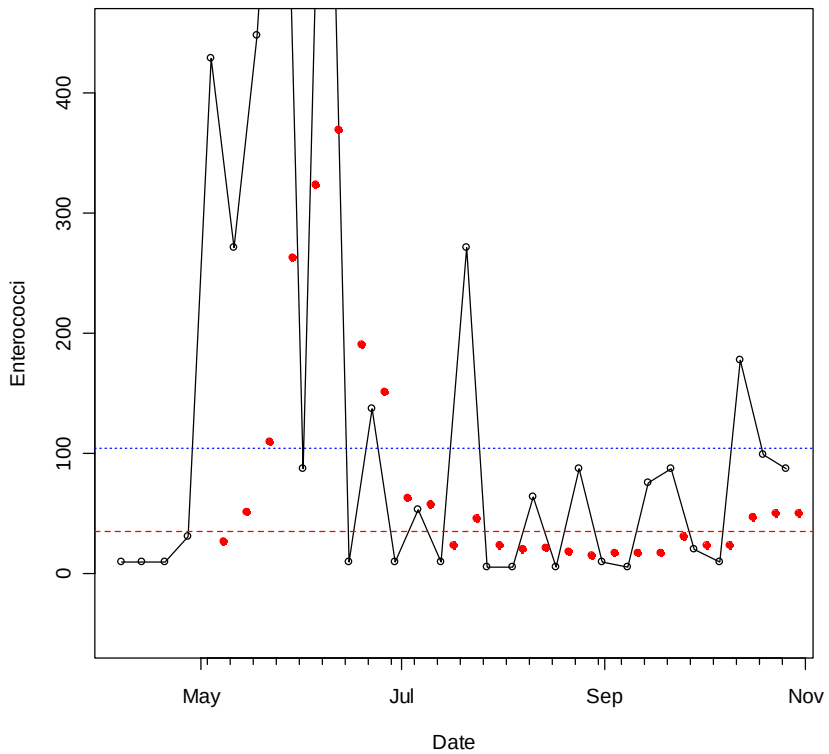
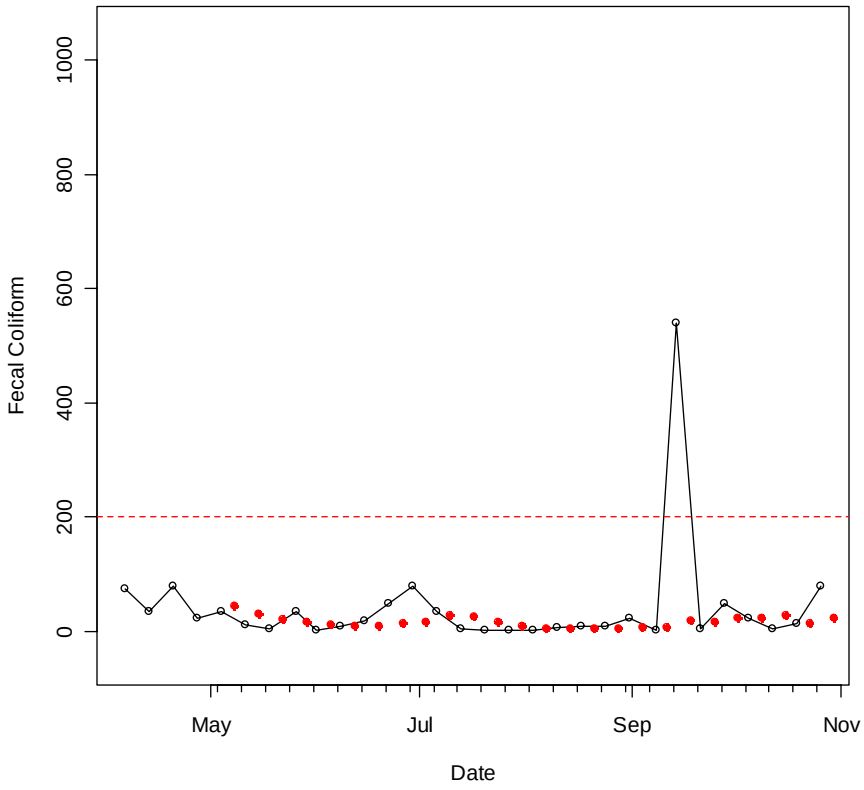


Figure B.1. Time series of fecal coliform (A) and enterococci (B) sample results collected during 2009 at CNST1. Sample results are shown as open dots (○), running 30-day geometric means are shown as red dots (●), and geometric mean and single sample maximum criteria are shown as red and blue dashed horizontal lines, respectively.

A



B

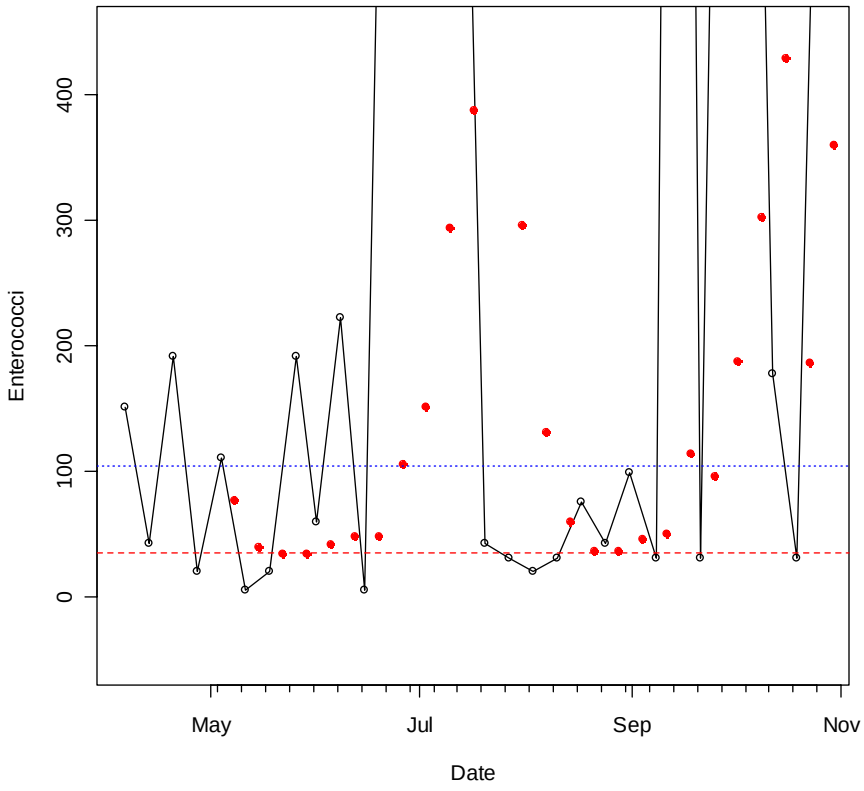
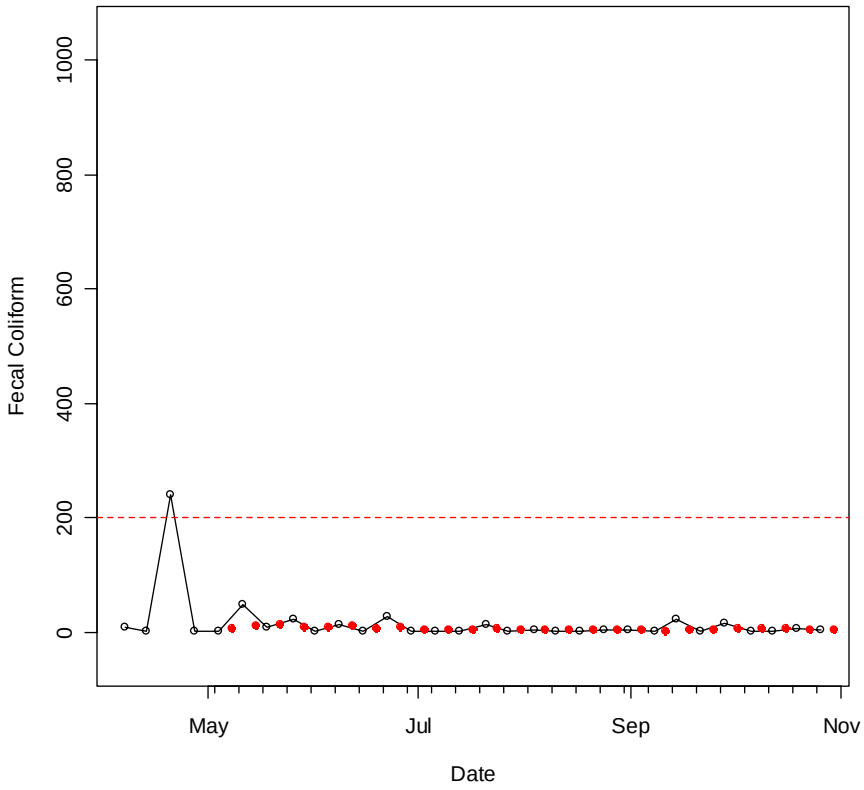


Figure B.2. Time series of sample results collected during 2009 at CYPT1.

A



B

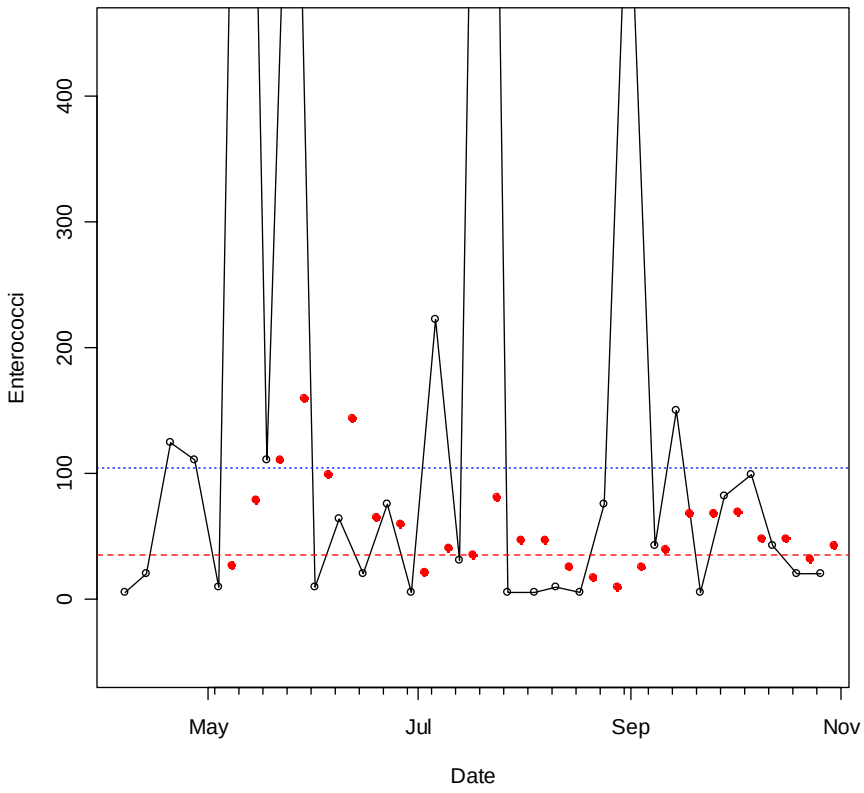
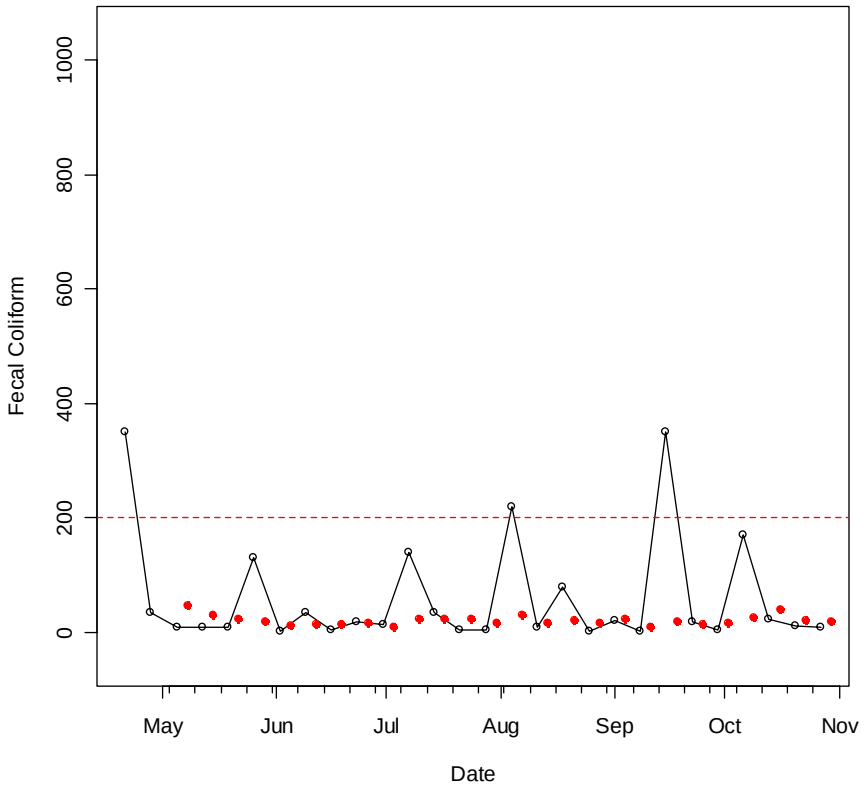


Figure B.3. Time series of sample results collected during 2009 at DUNG1.

A



B

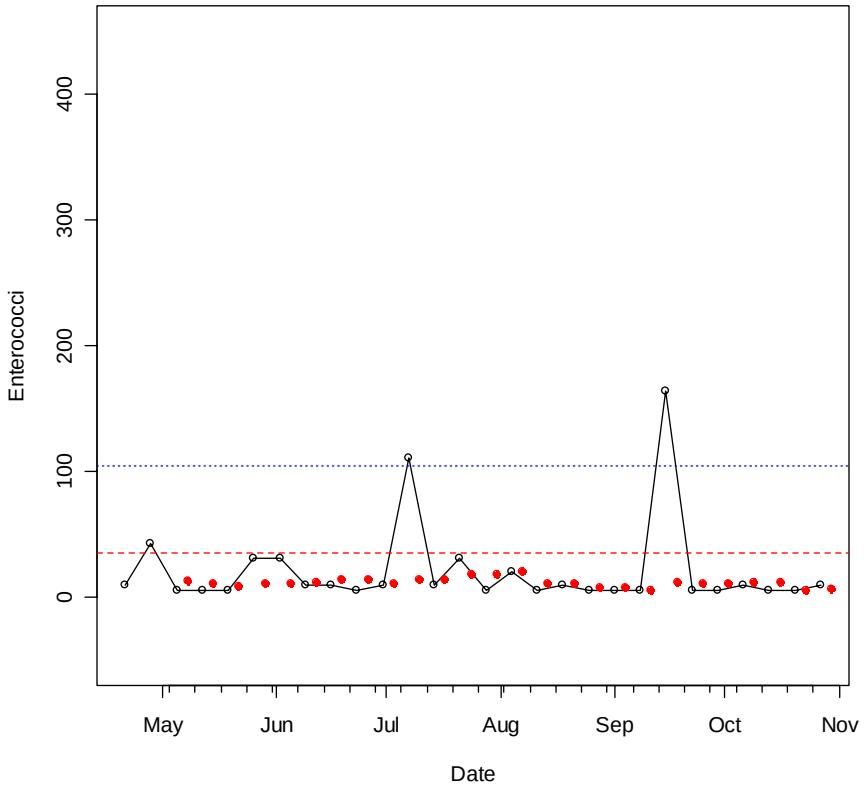
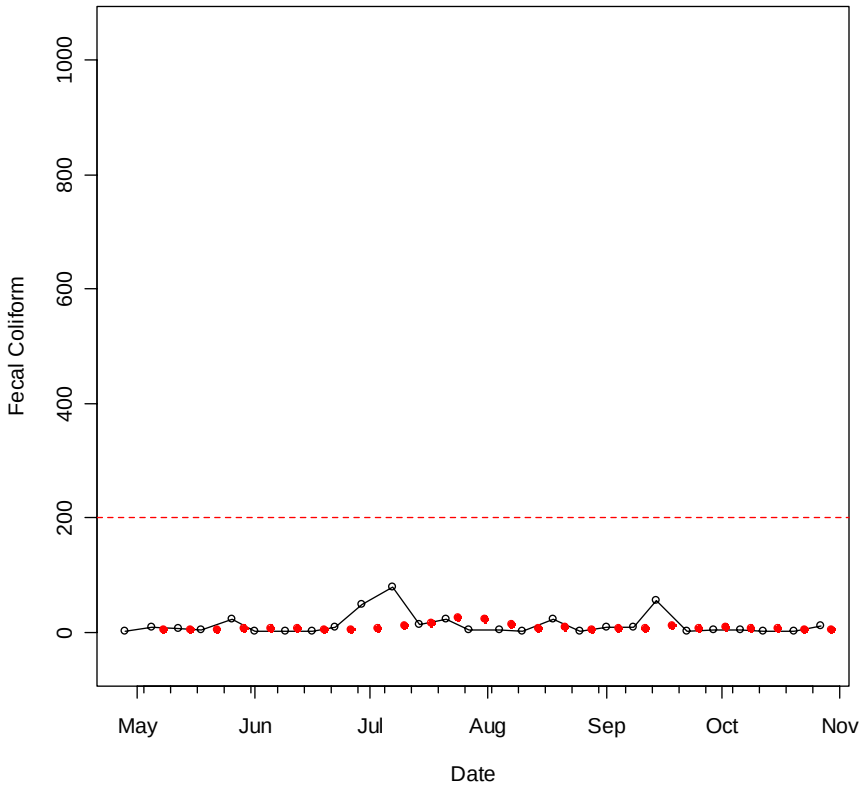


Figure B.4. Time series of sample results collected during 2009 at FNTB1.

A



B

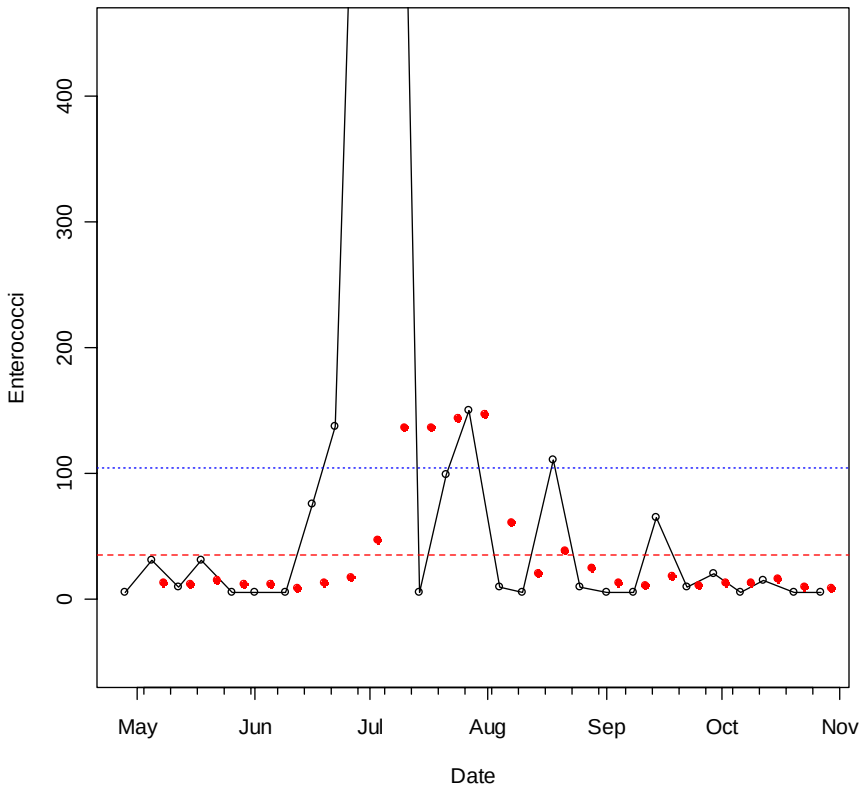
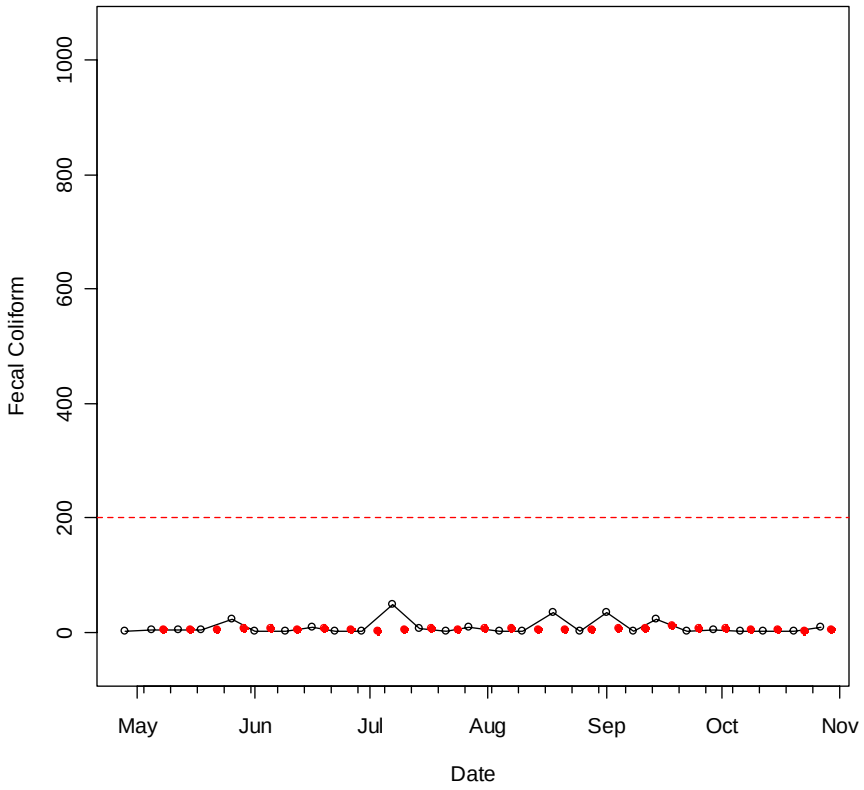


Figure B.5. Time series of sample results collected during 2009 at FOUR1.

A



B

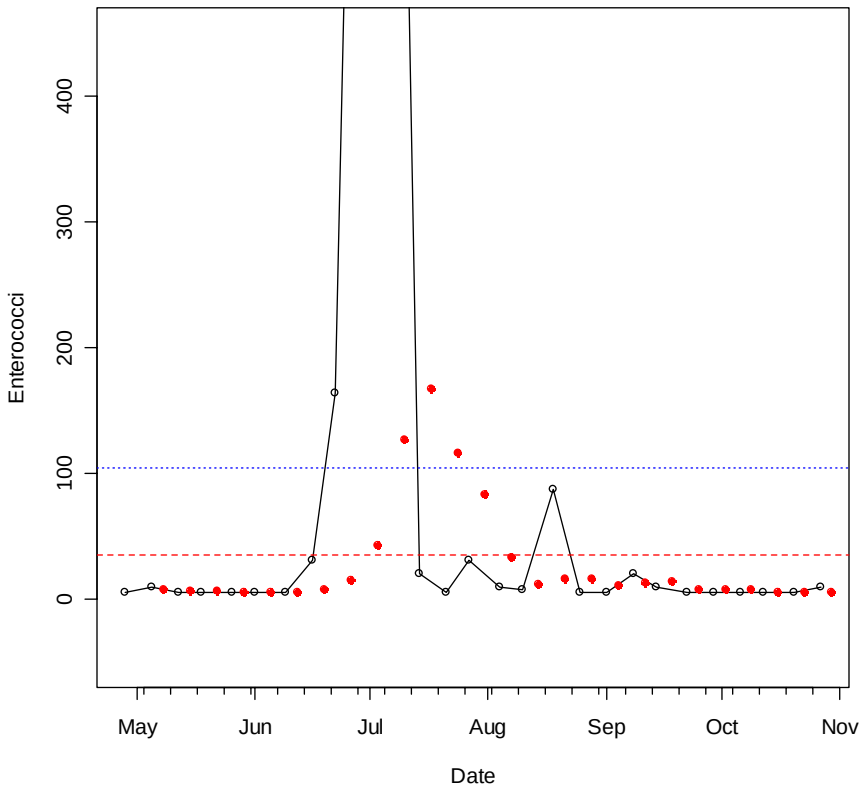
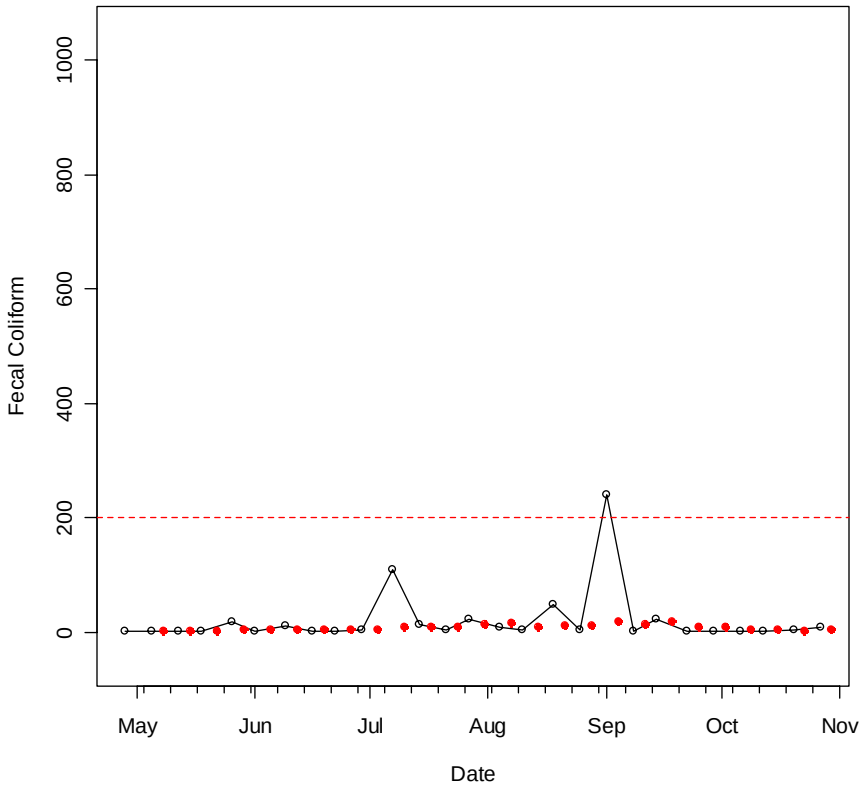


Figure B.6. Time series of sample results collected during 2009 at FOUR2.

A



B

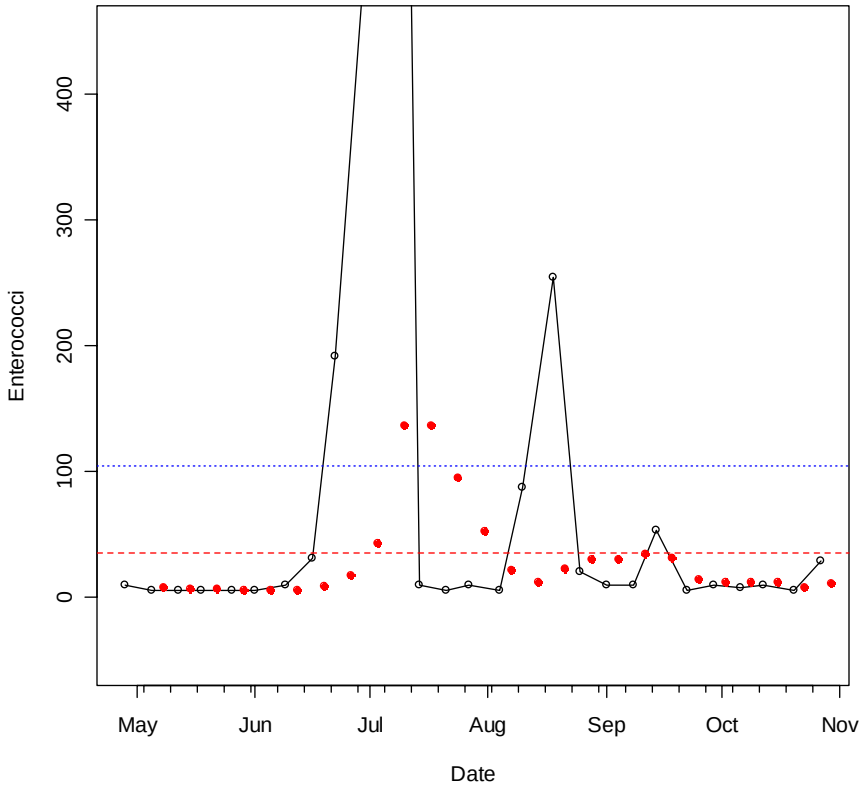
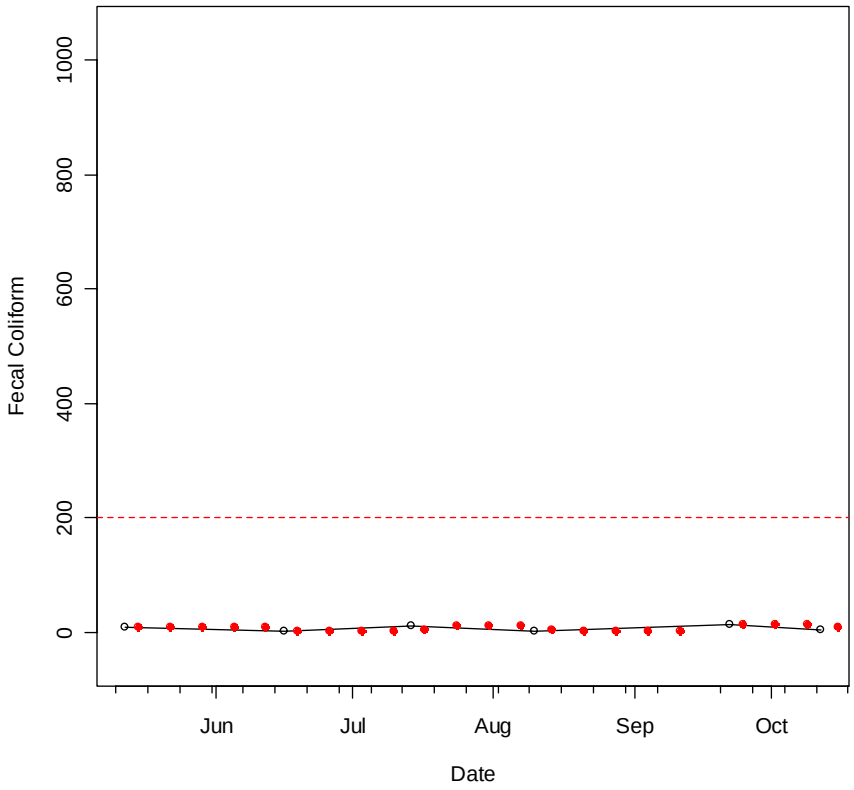


Figure B.7. Time series of sample results collected during 2009 at FOUR3.

A



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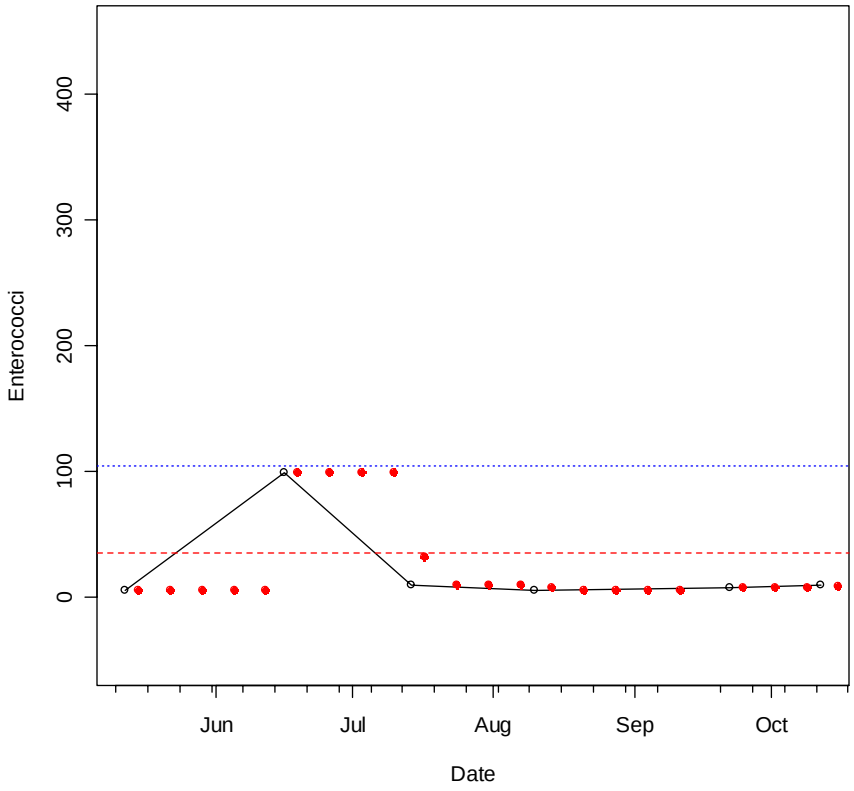
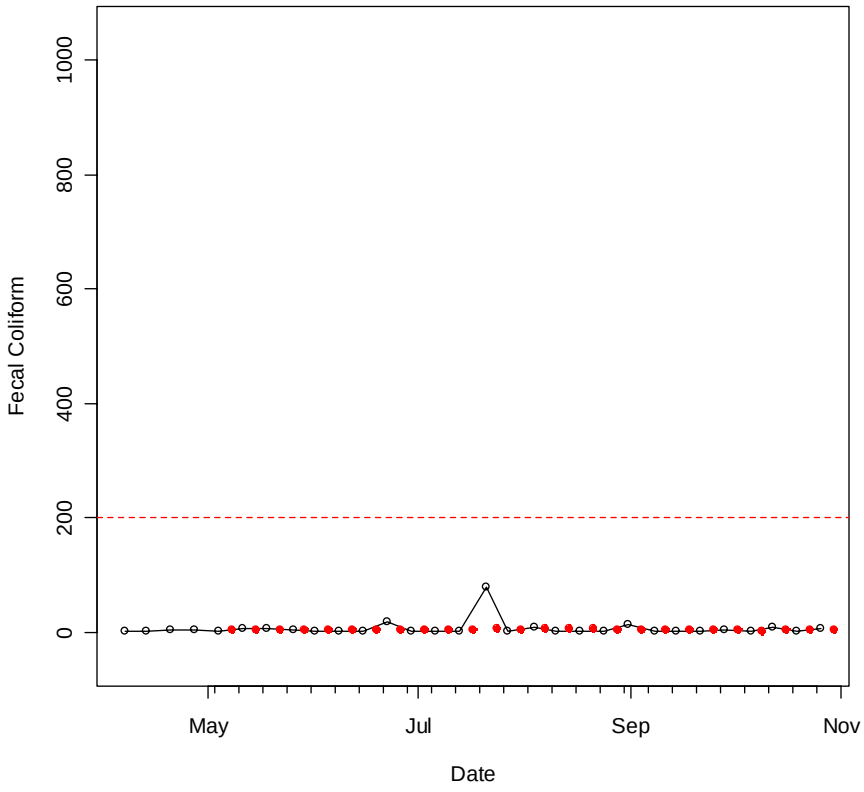


Figure B.8. Time series of sample results collected during 2009 at FOUR4.

A



B

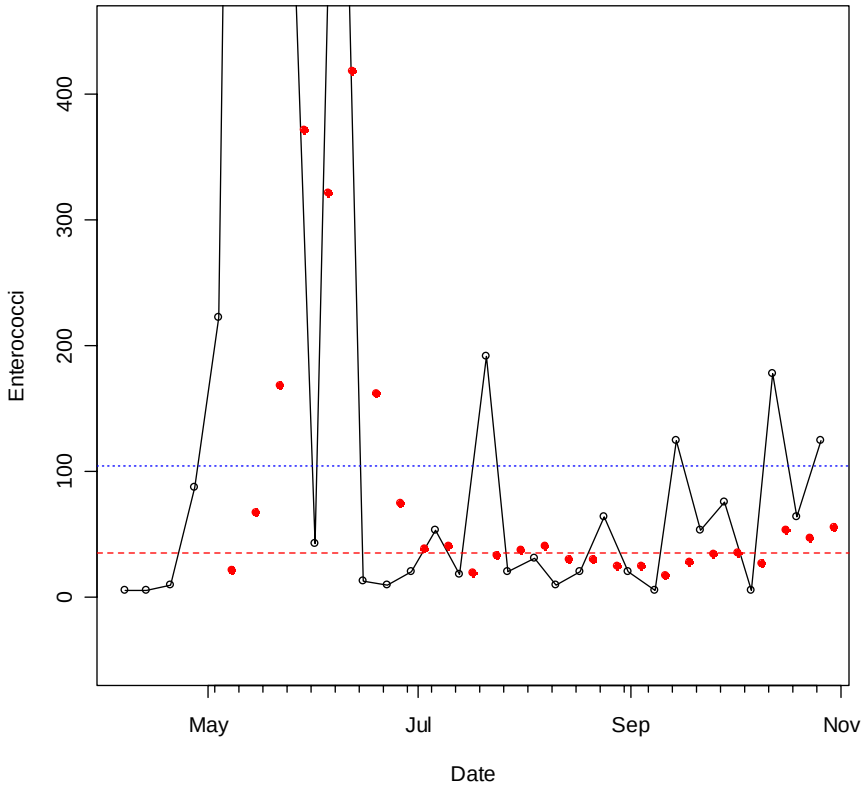
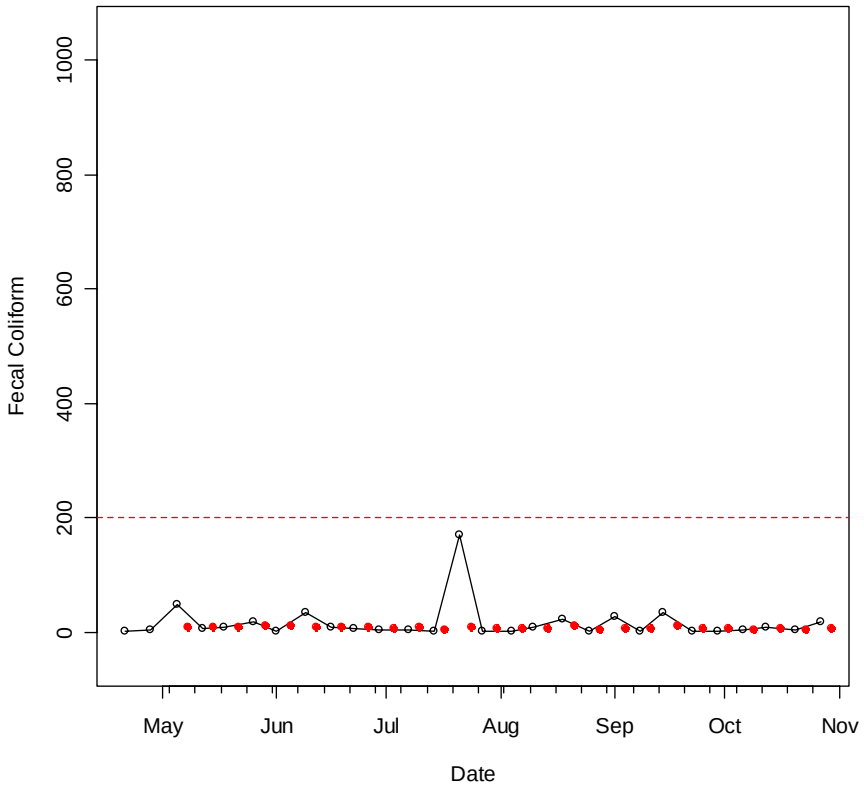


Figure B.9. Time series of sample results collected during 2009 at GBRZ1.

A



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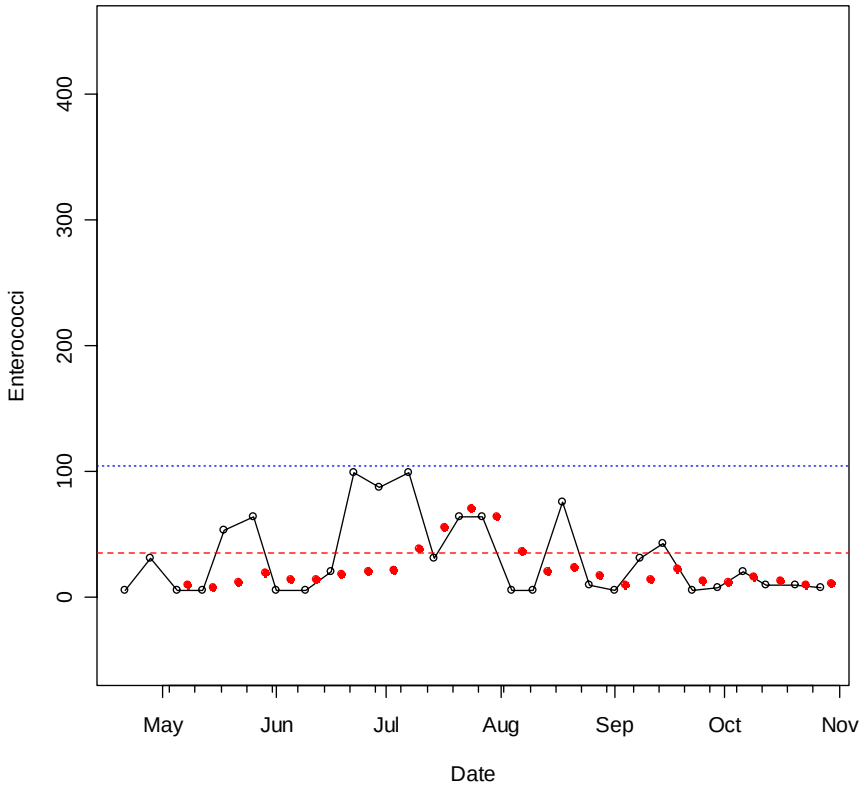
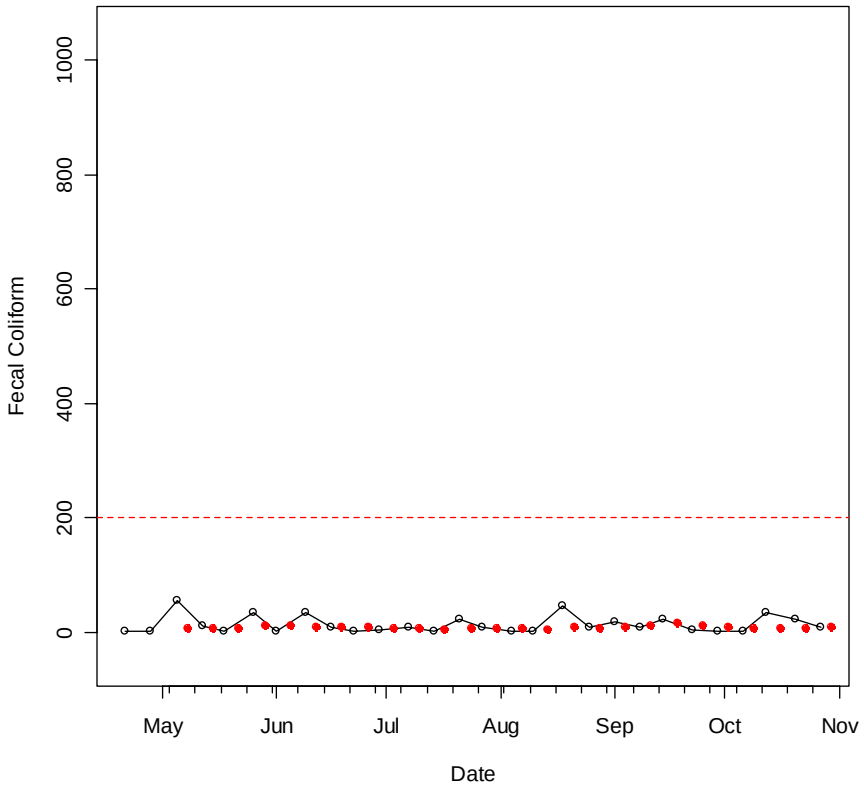


Figure B.10. Time series of sample results collected during 2009 at GIB1.

A



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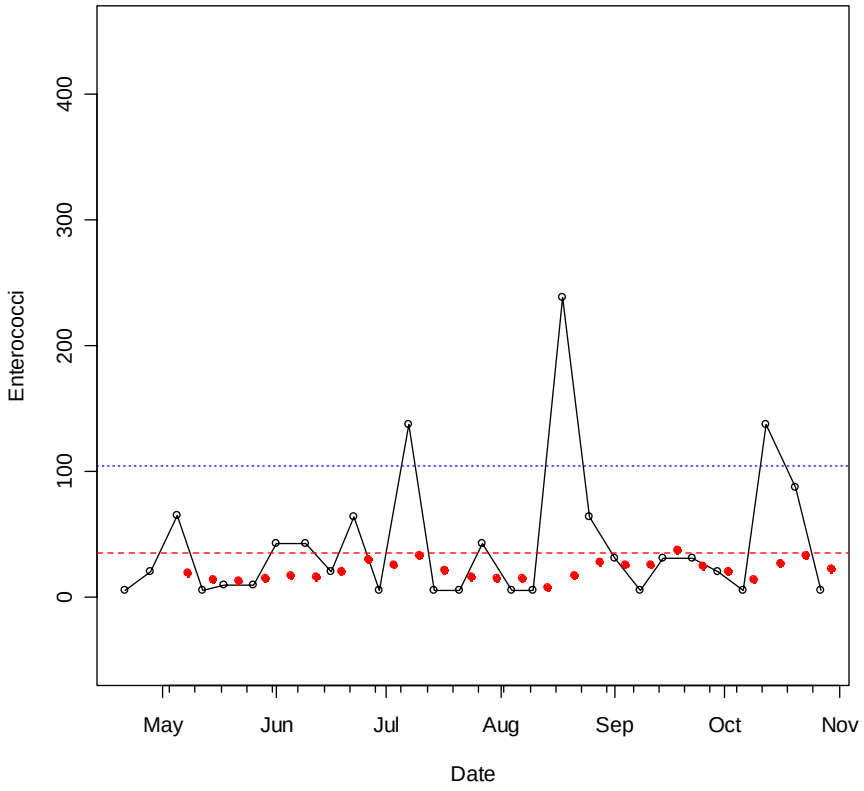
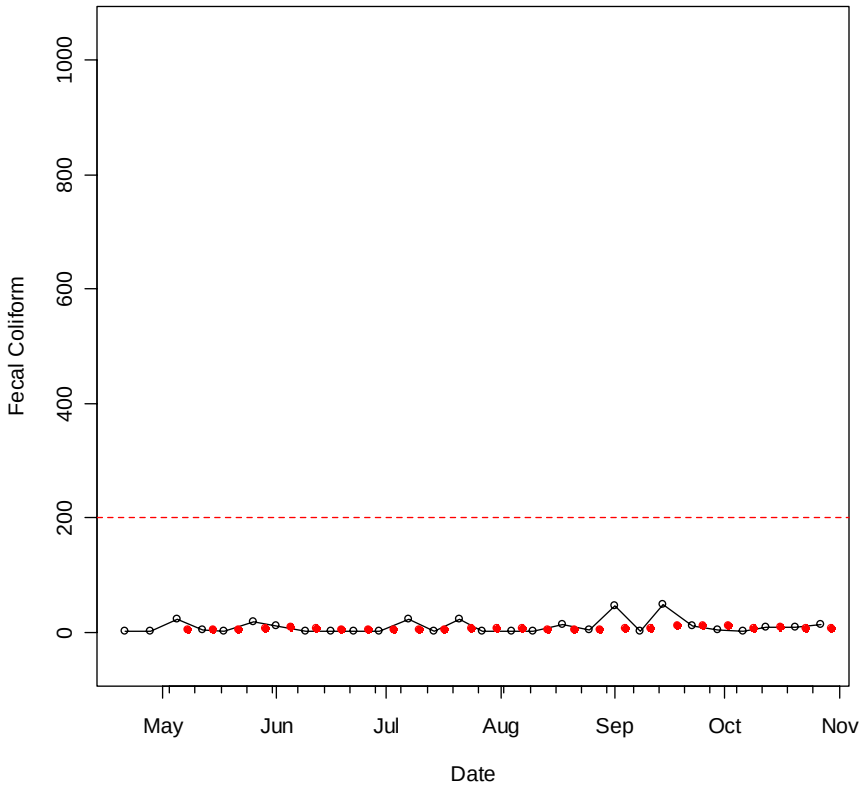


Figure B.11. Time series of sample results collected during 2009 at GIB2.

A



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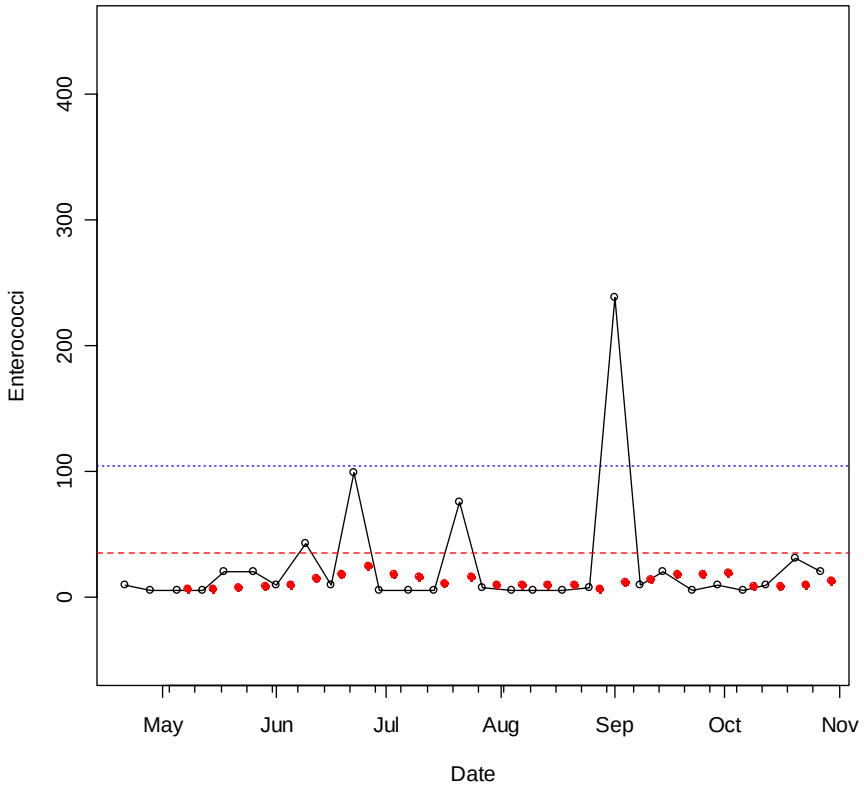
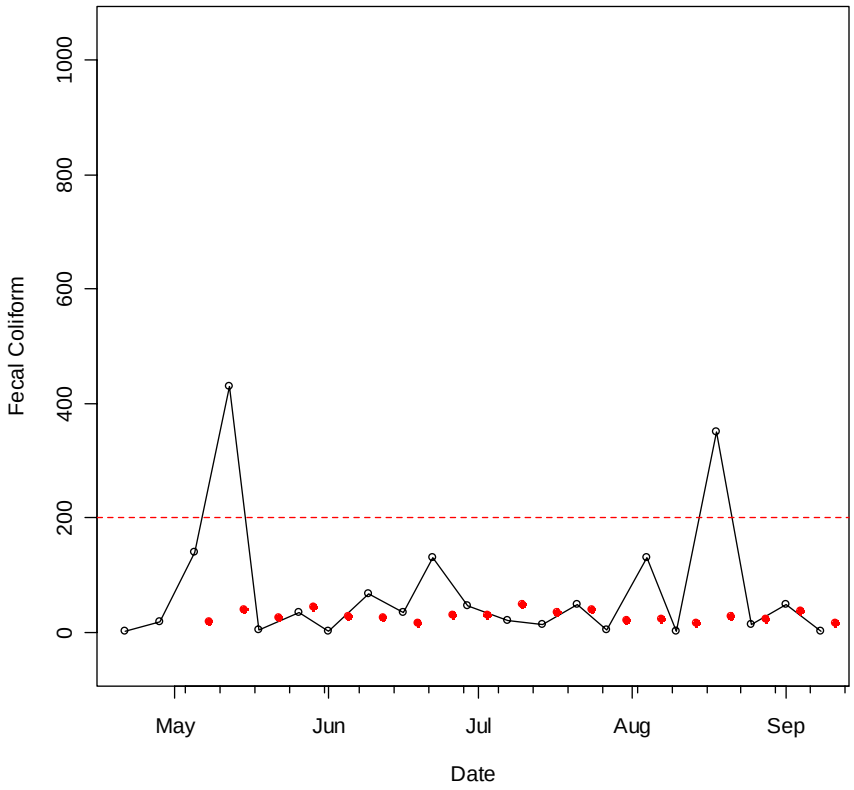


Figure B.12. Time series of sample results collected during 2009 at GIB3.

A



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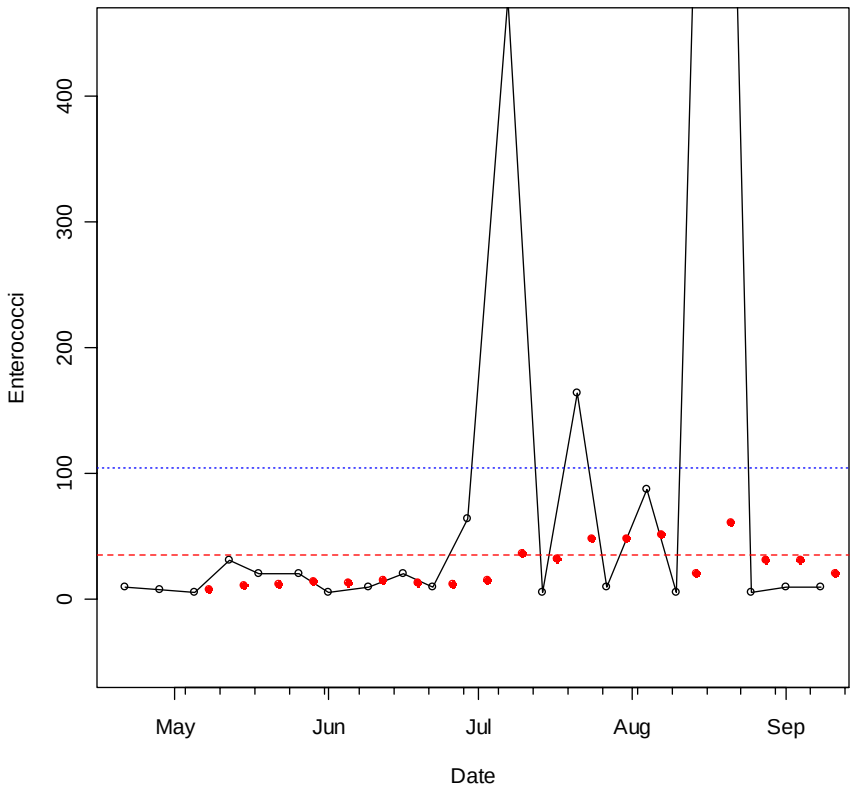
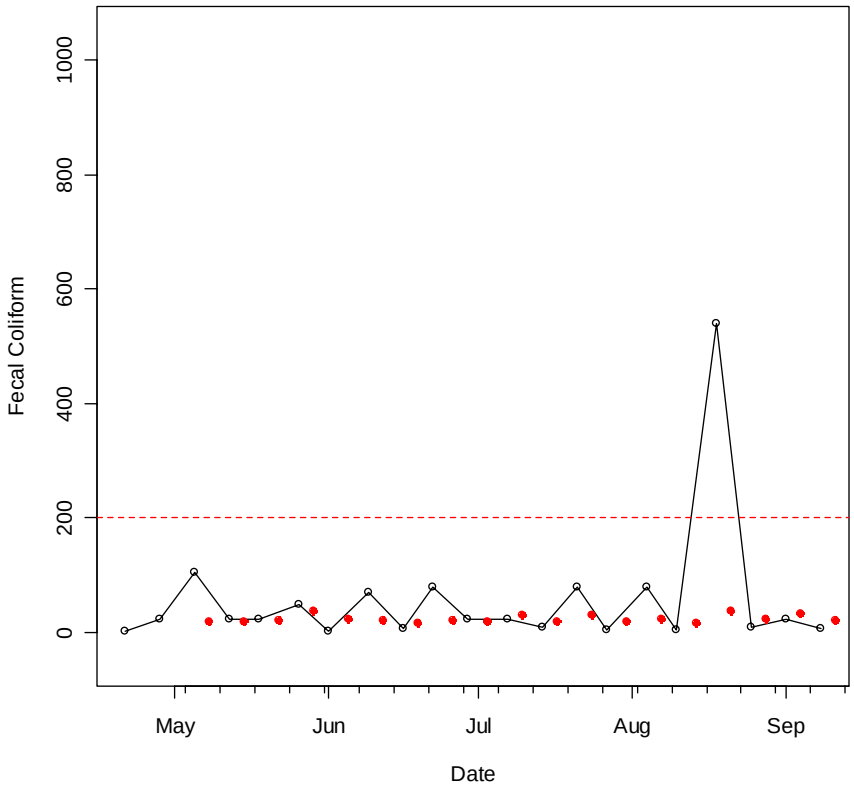


Figure B.13. Time series of sample results collected during 2009 at GISP1.

A



B

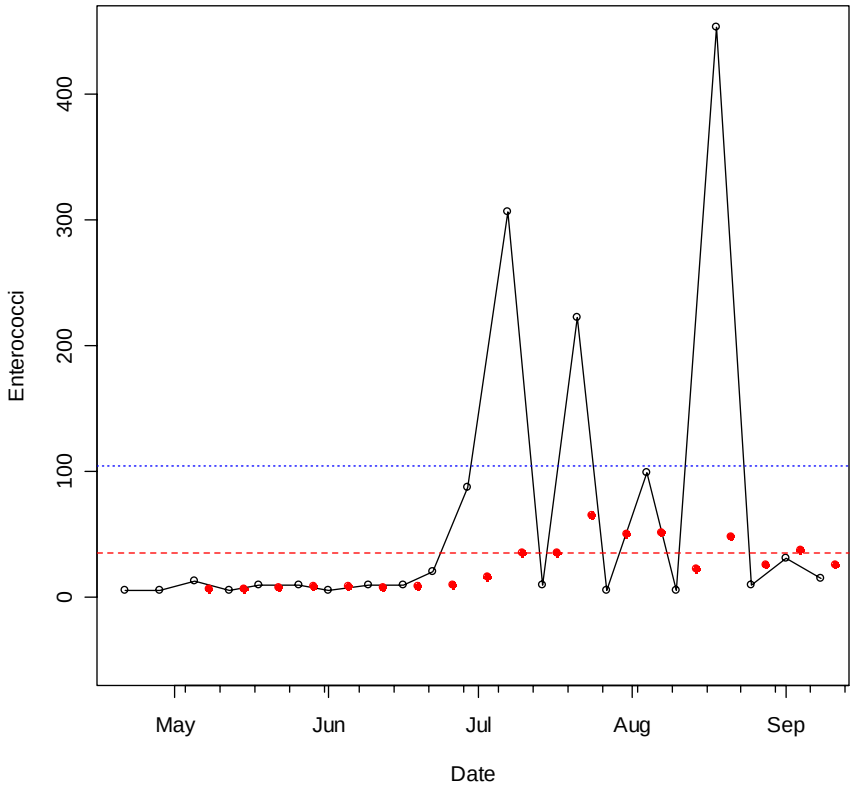
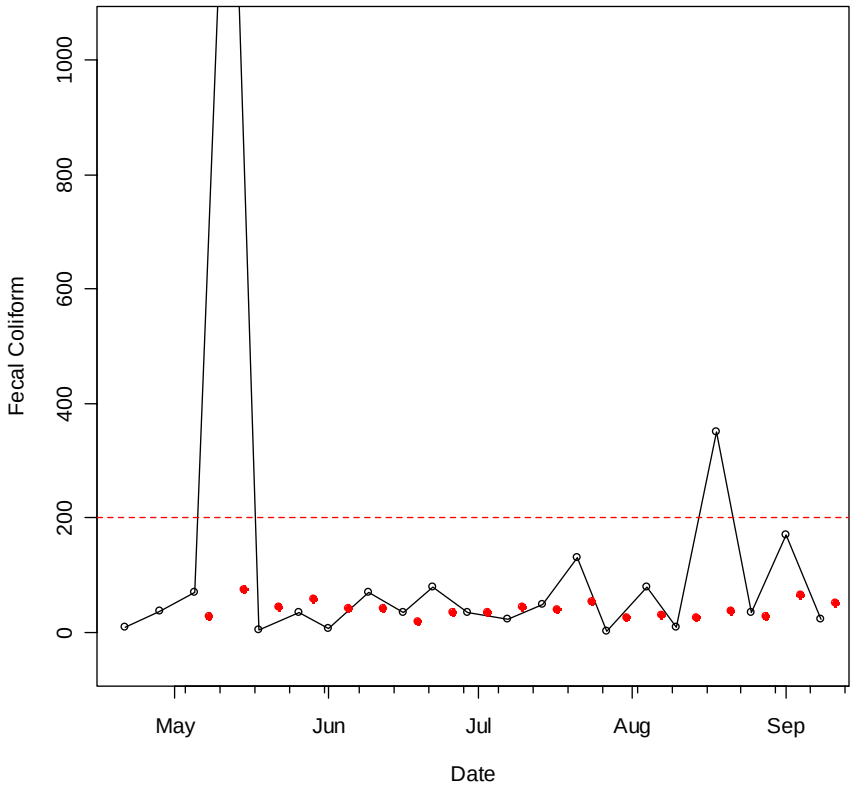


Figure B.14. Time series of sample results collected during 2009 at GISP2.

A



B

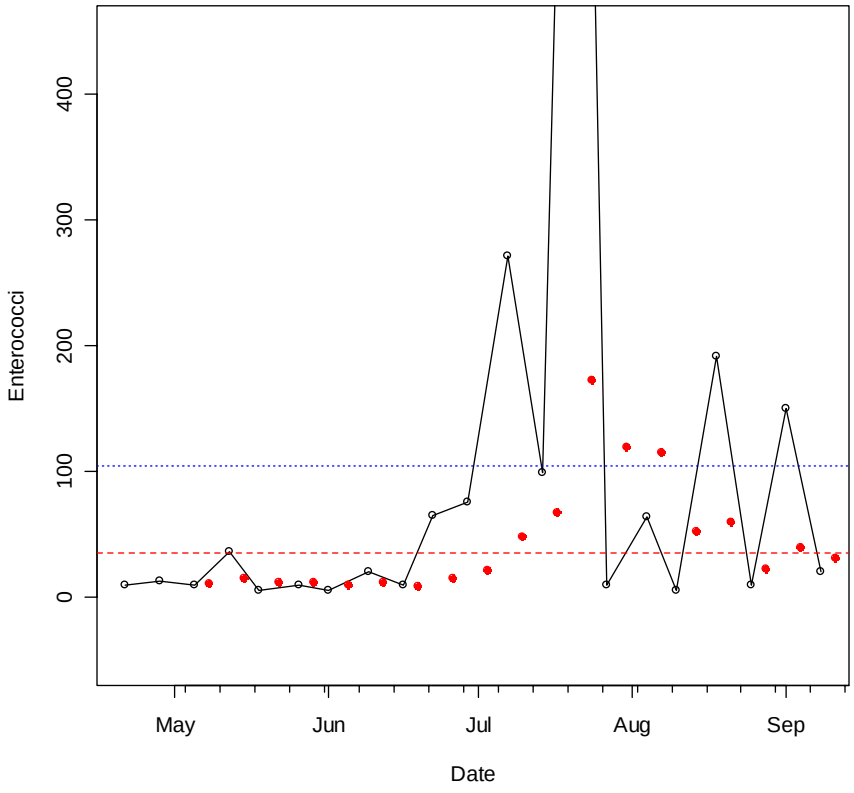
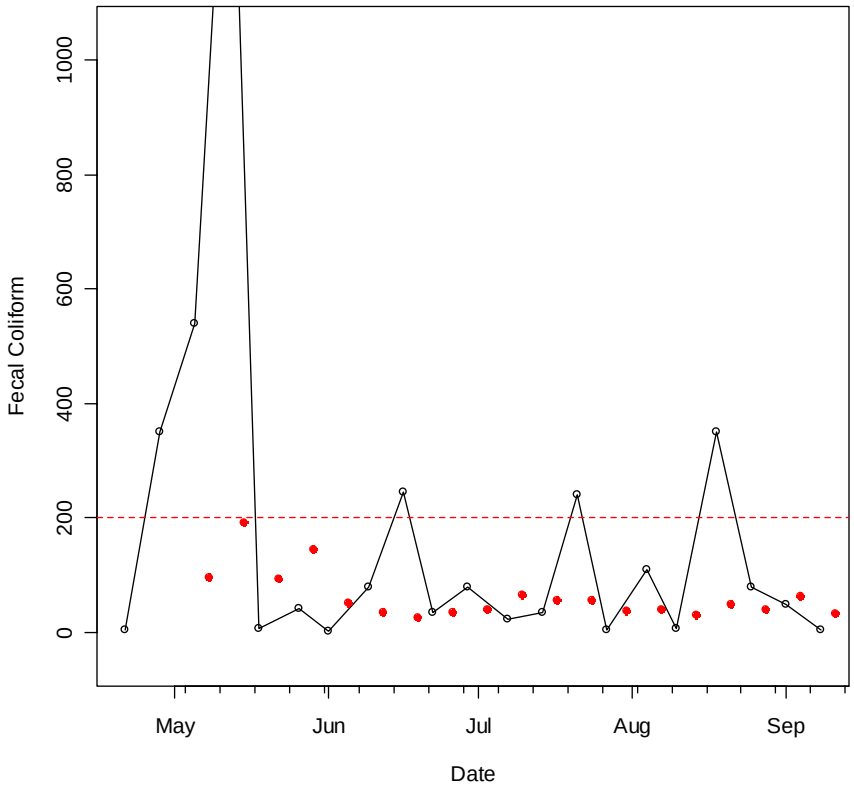


Figure B.15. Time series of sample results collected during 2009 at GISP3.

A



B

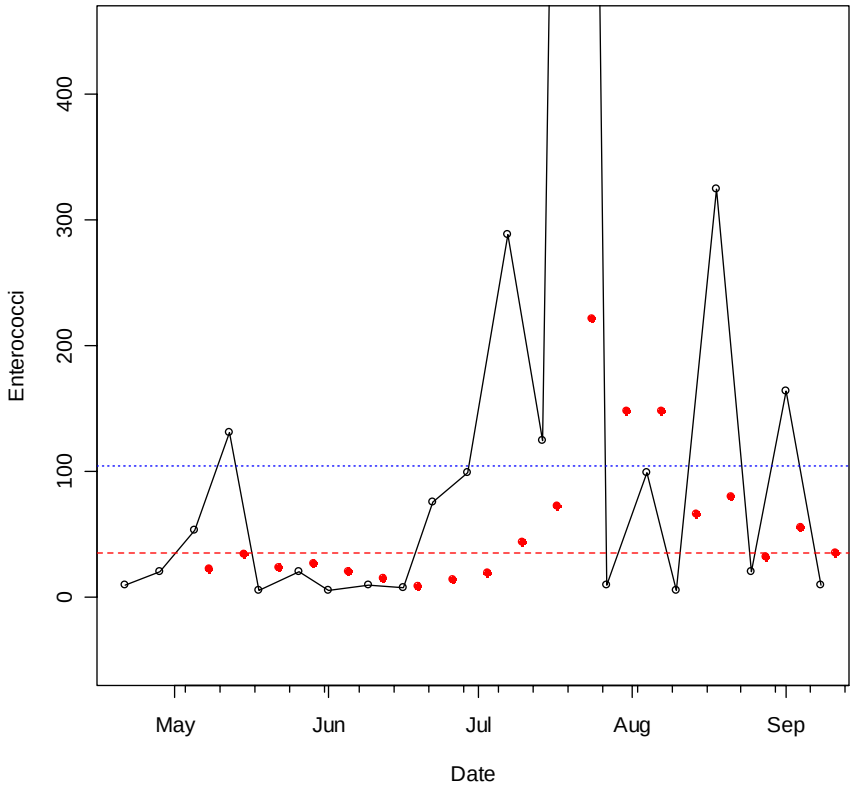
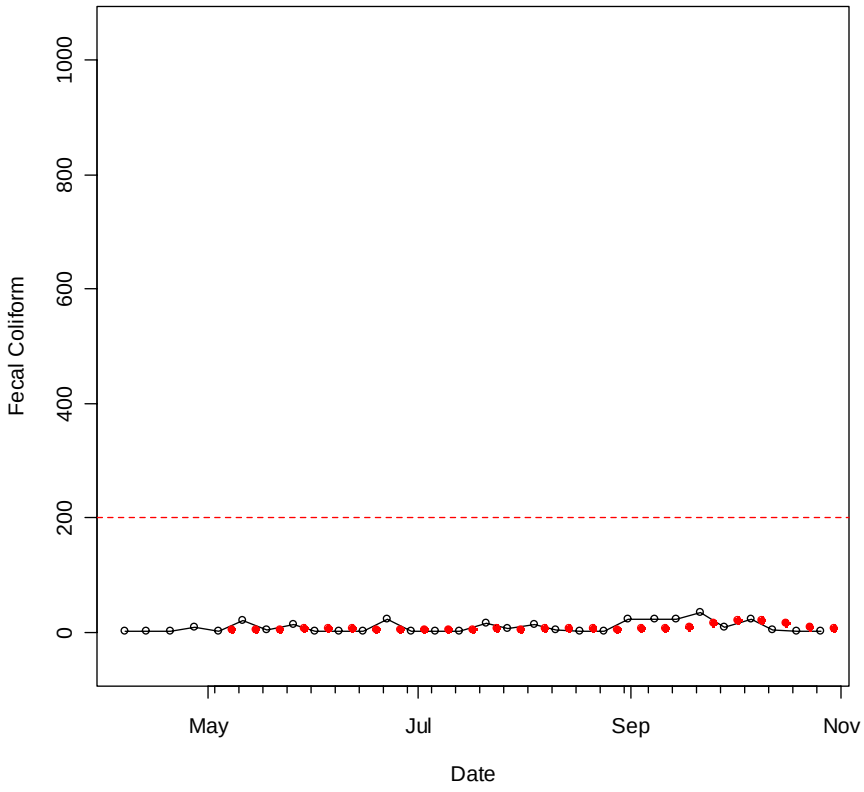


Figure B.16. Time series of sample results collected during 2009 at GISP4.

A



B

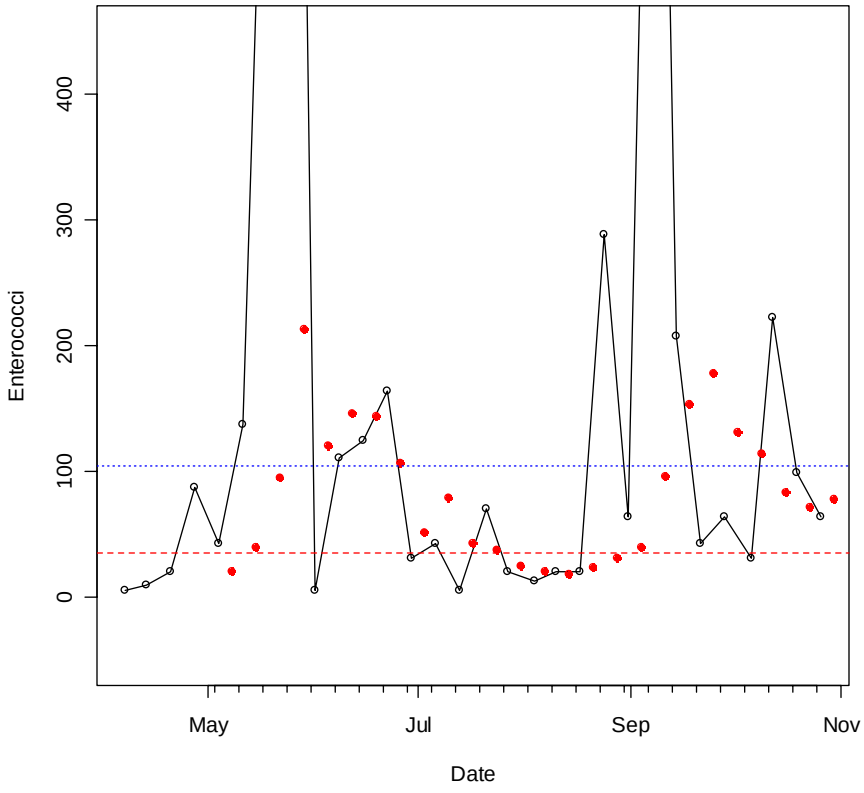
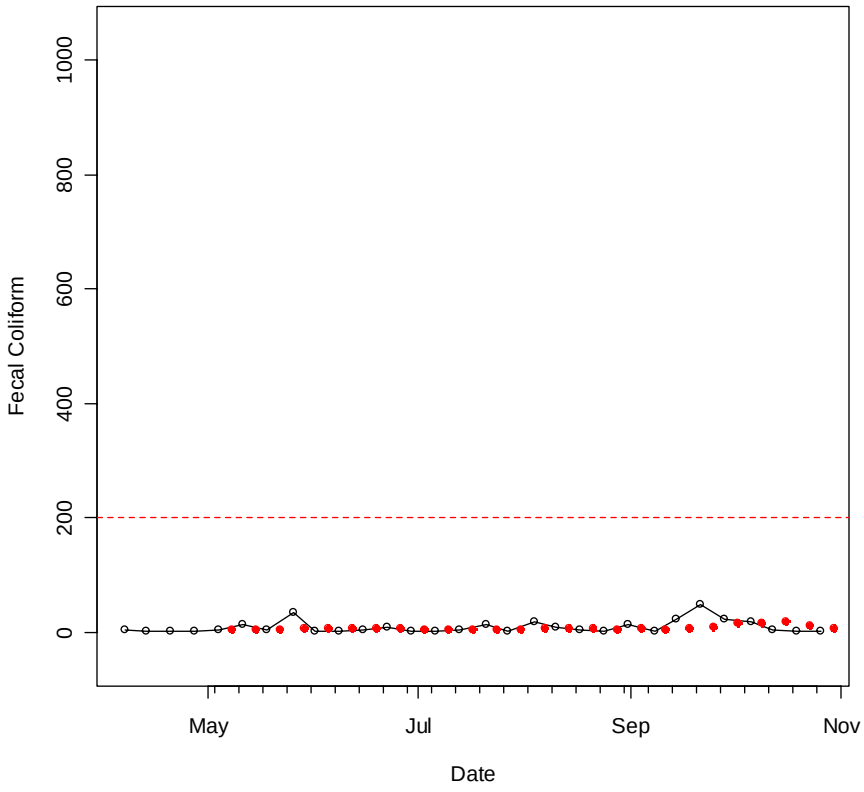


Figure B.17. Time series of sample results collected during 2009 at HOLLY1.

A



B

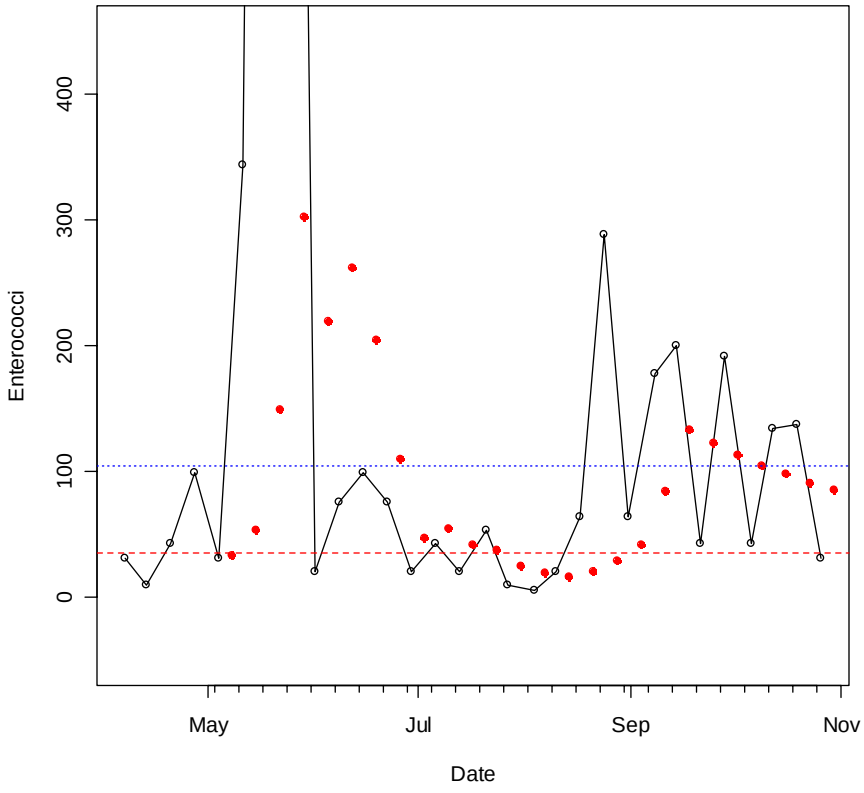
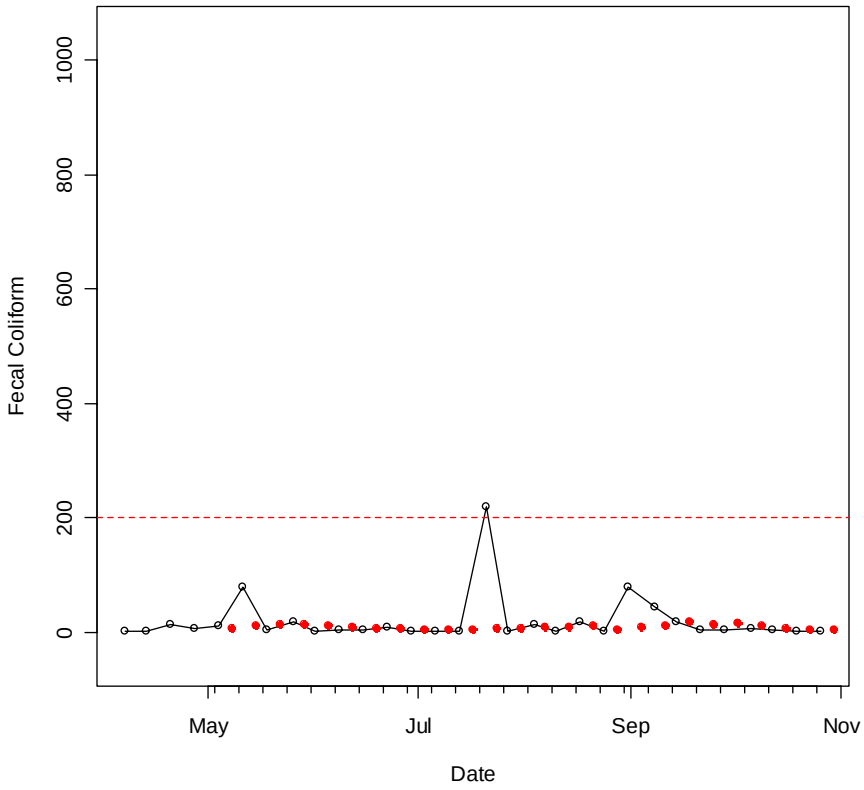


Figure B.18. Time series of sample results collected during 2009 at HOLLY2.

A



B

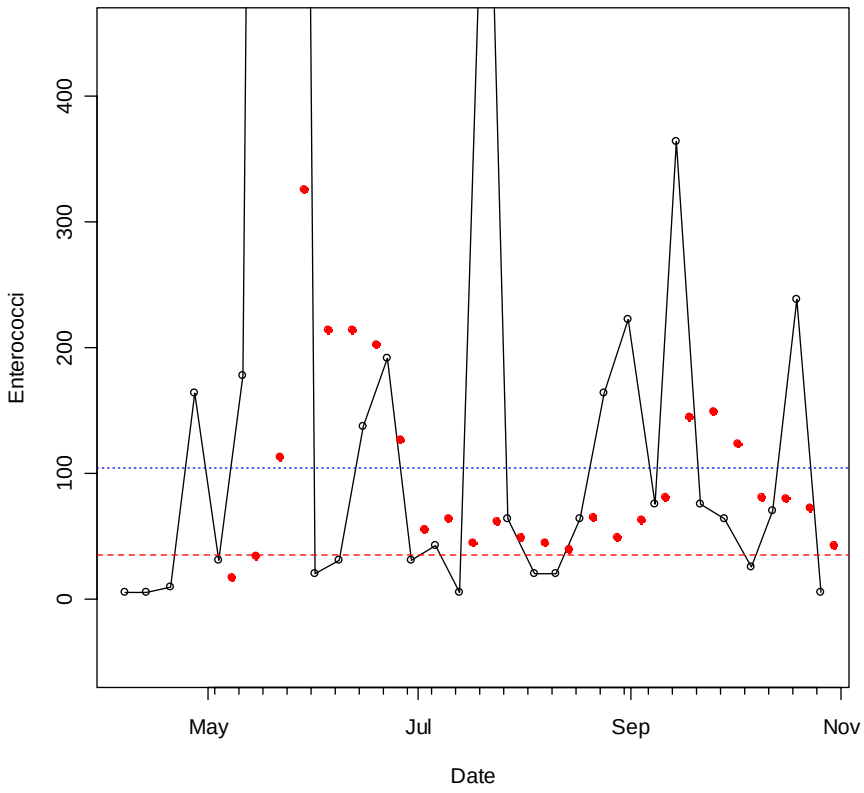
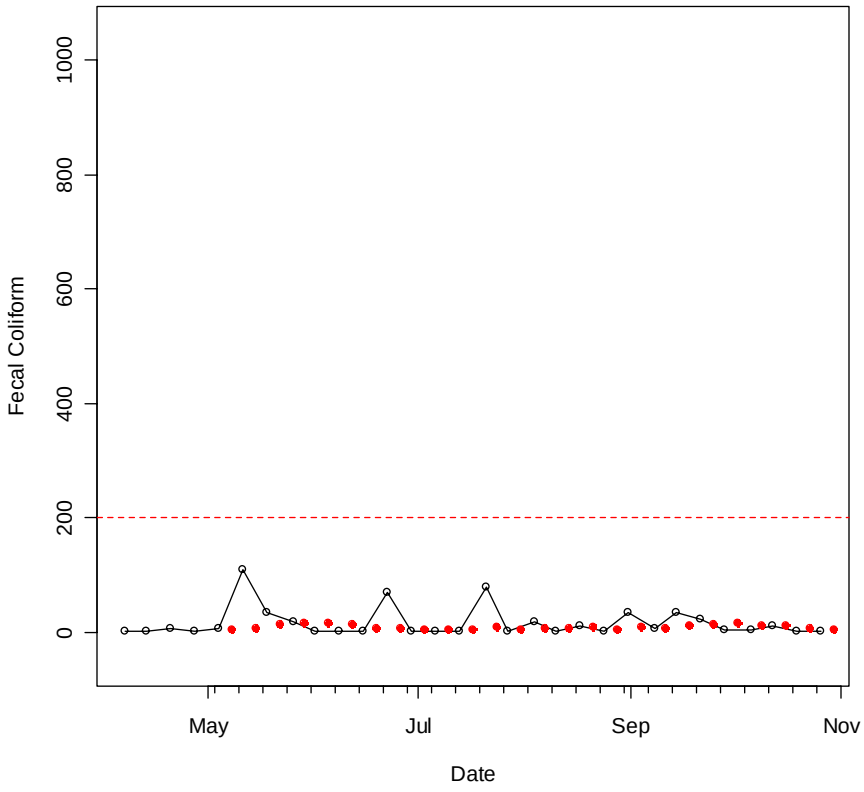


Figure B.19. Time series of sample results collected during 2009 at HOLLY3.

A



B

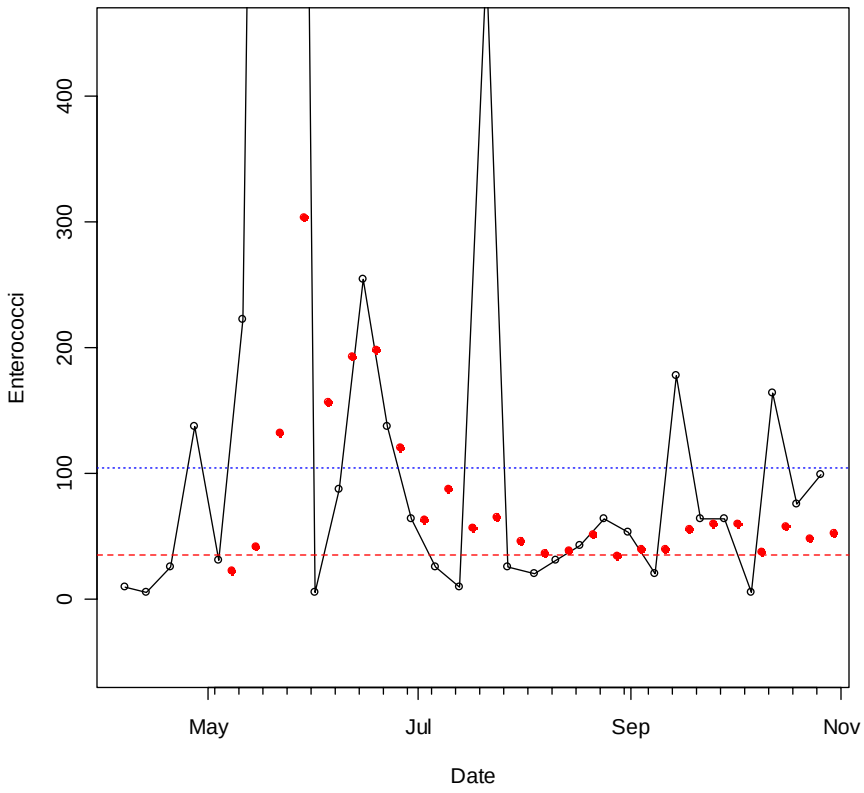
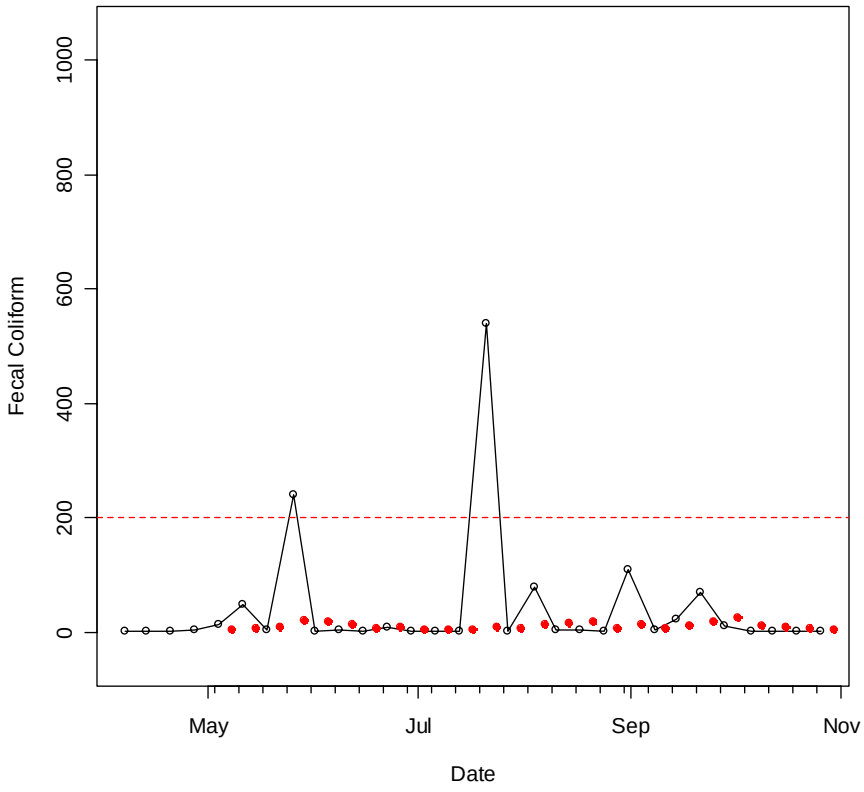


Figure B.20. Time series of sample results collected during 2009 at HOLLY4.

A



B

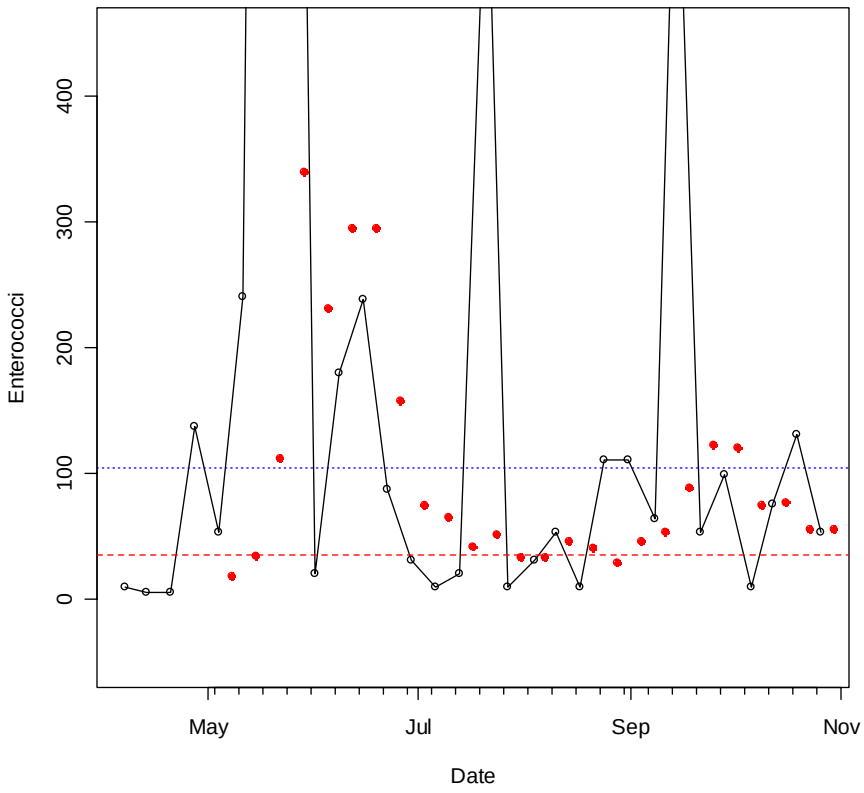
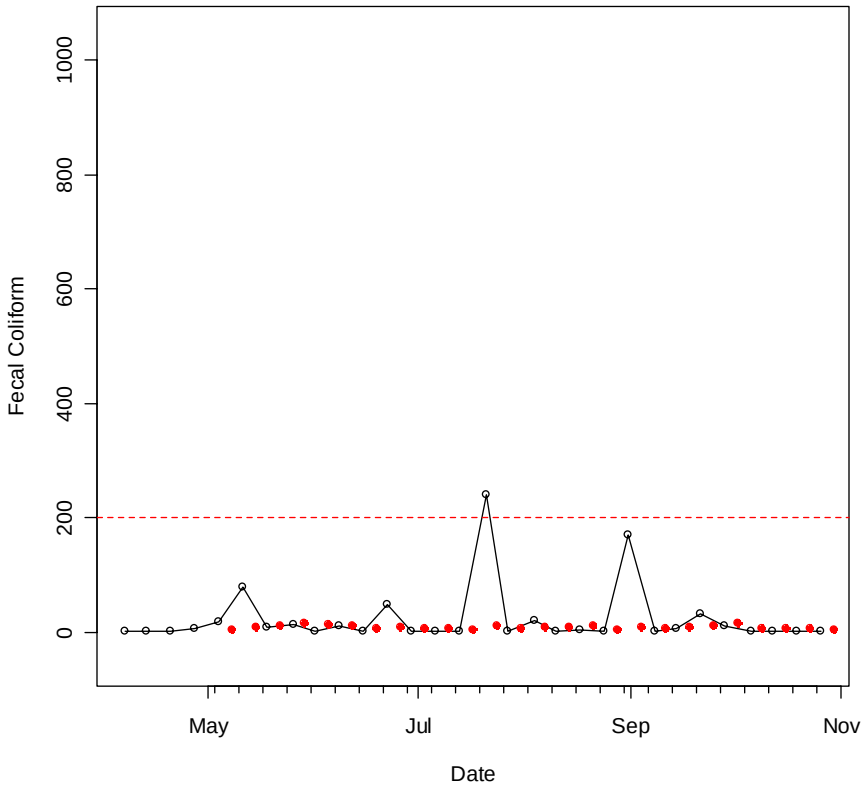


Figure B.21. Time series of sample results collected during 2009 at HOLLY5.

A



B

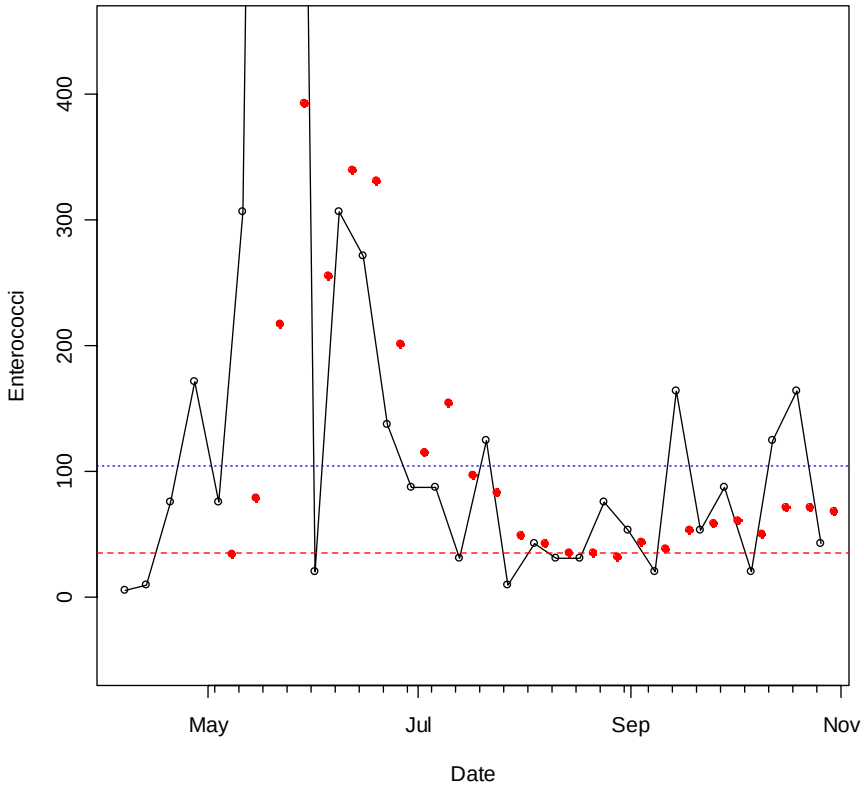
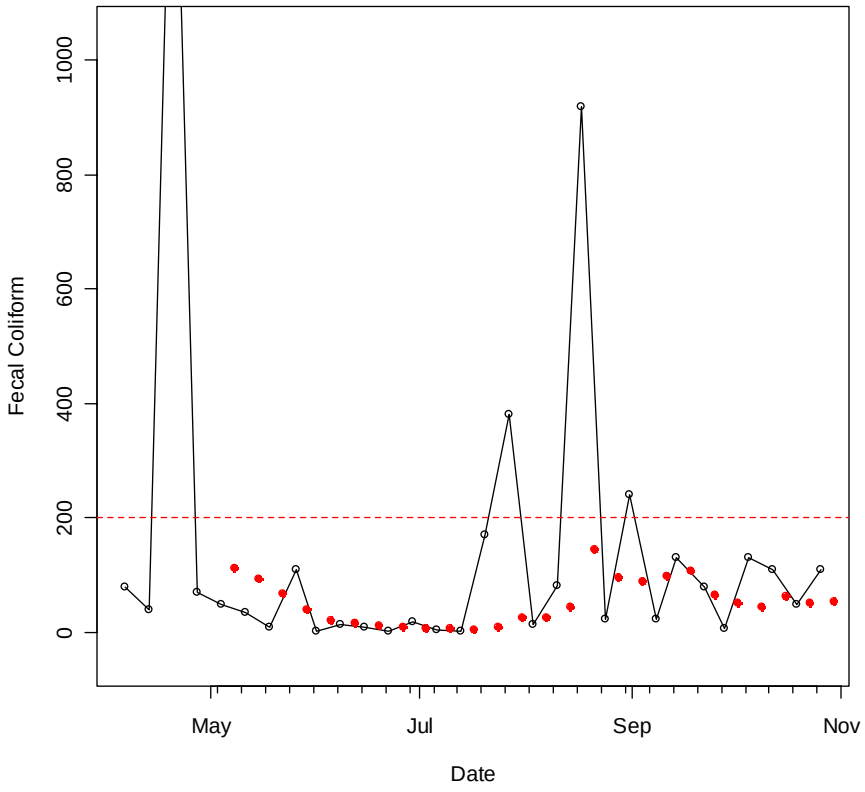


Figure B.22. Time series of sample results collected during 2009 at HOLLY6.

A



B

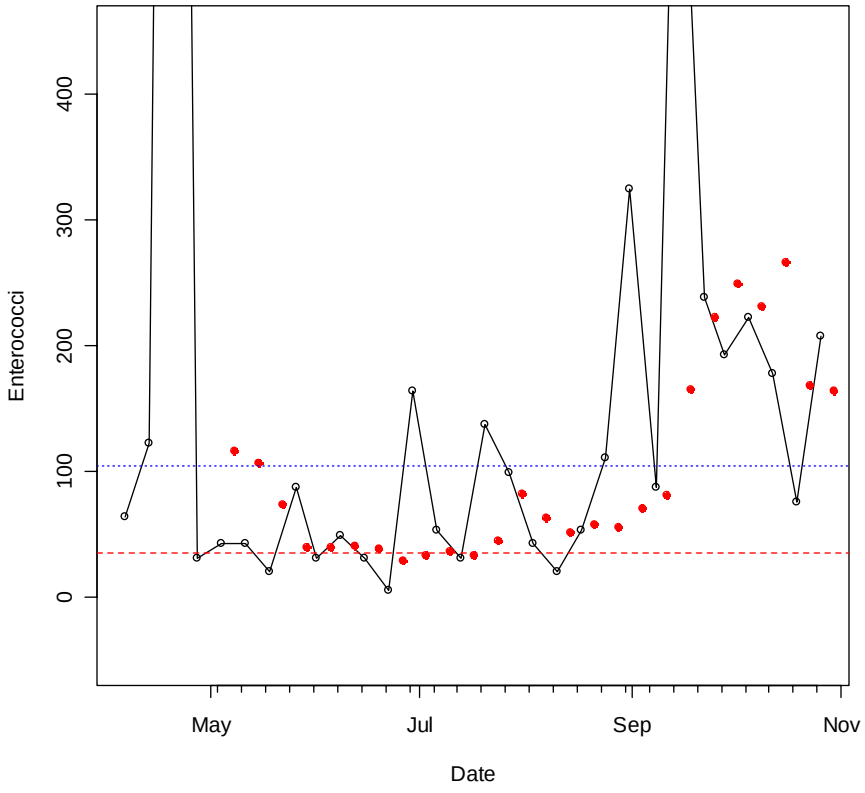
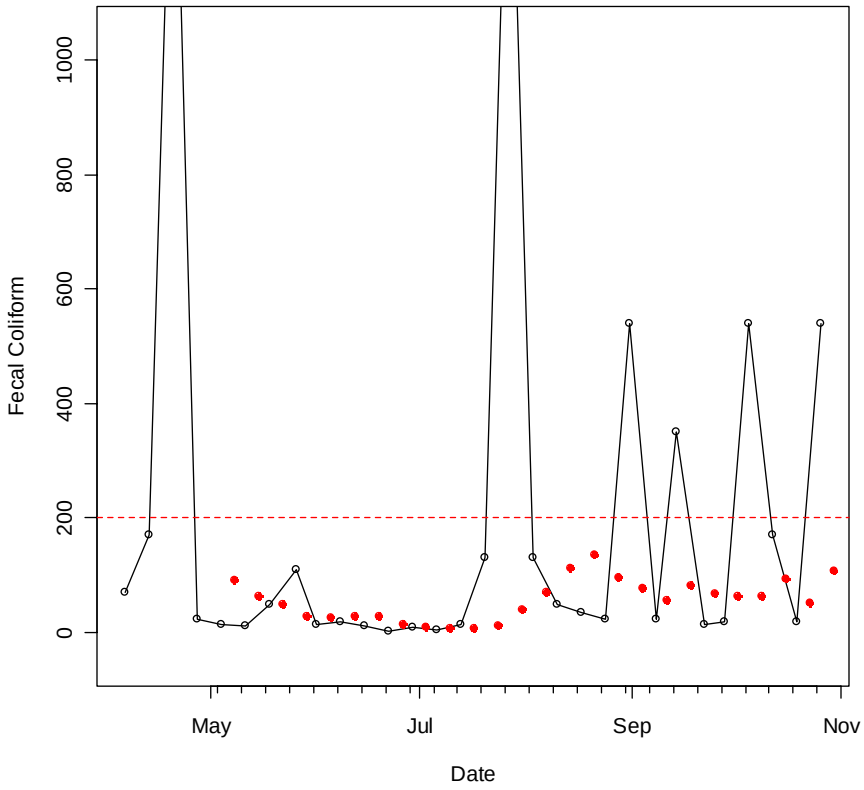


Figure B.23. Time series of sample results collected during 2009 at LCNB1.

A



B

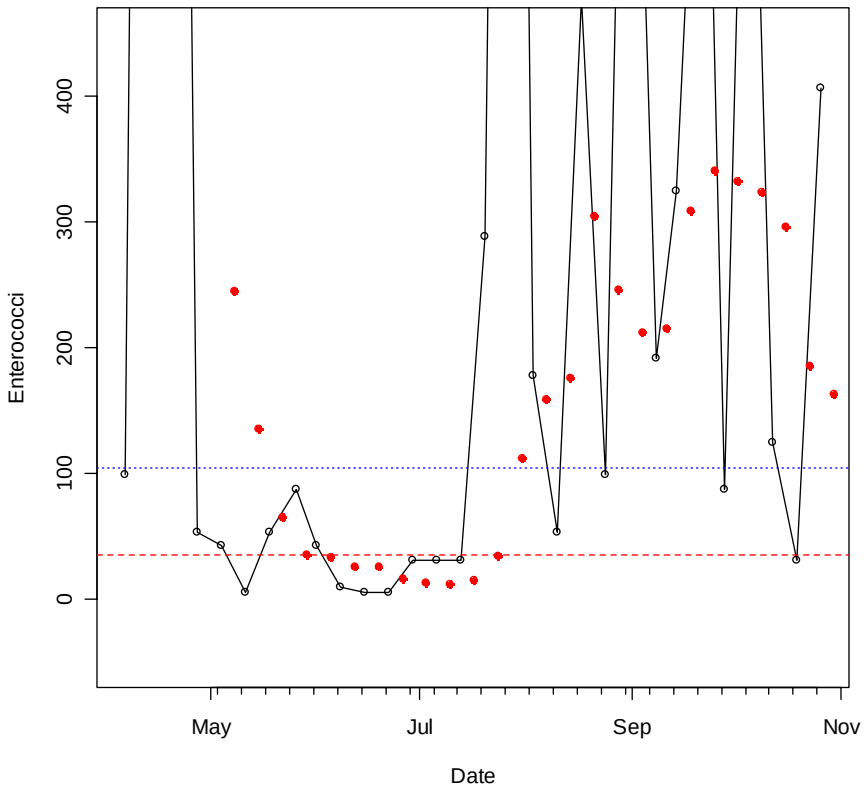
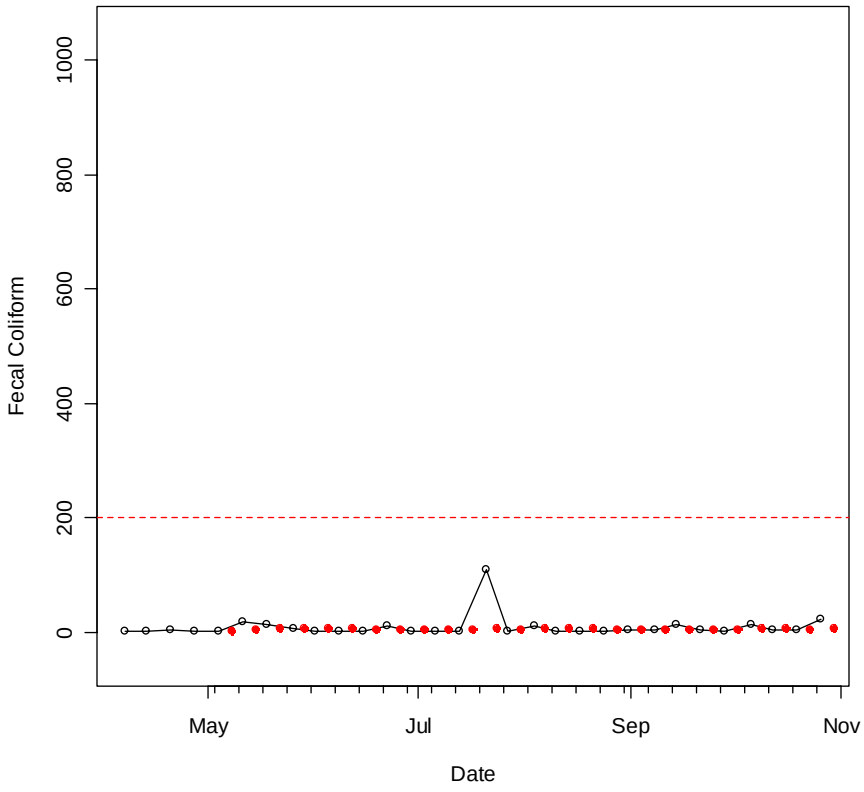


Figure B.24. Time series of sample results collected during 2009 at LCSB1.

A



B

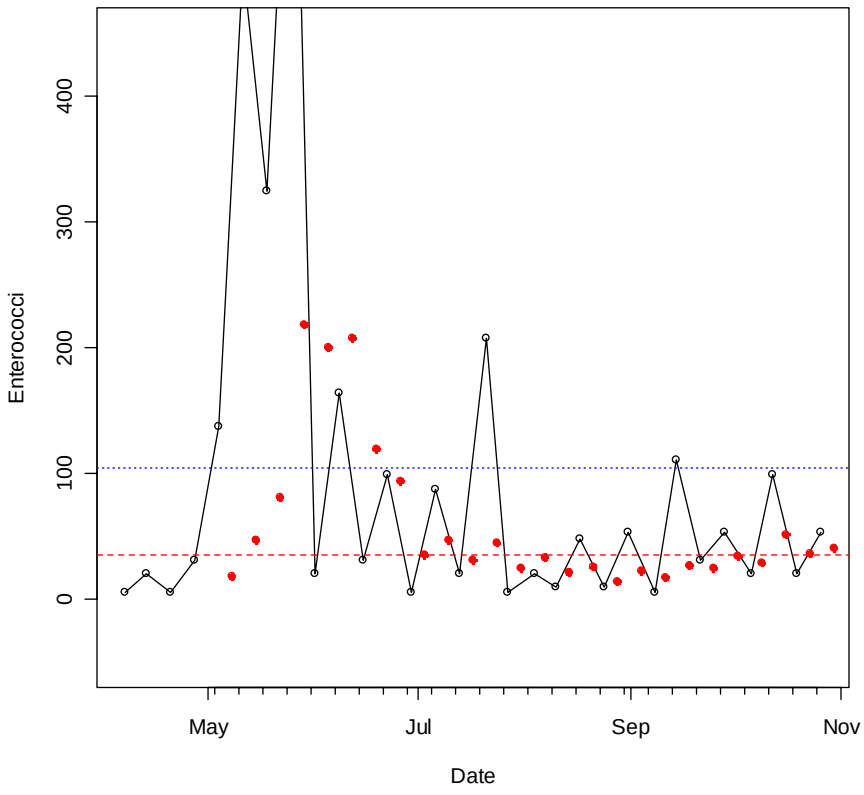
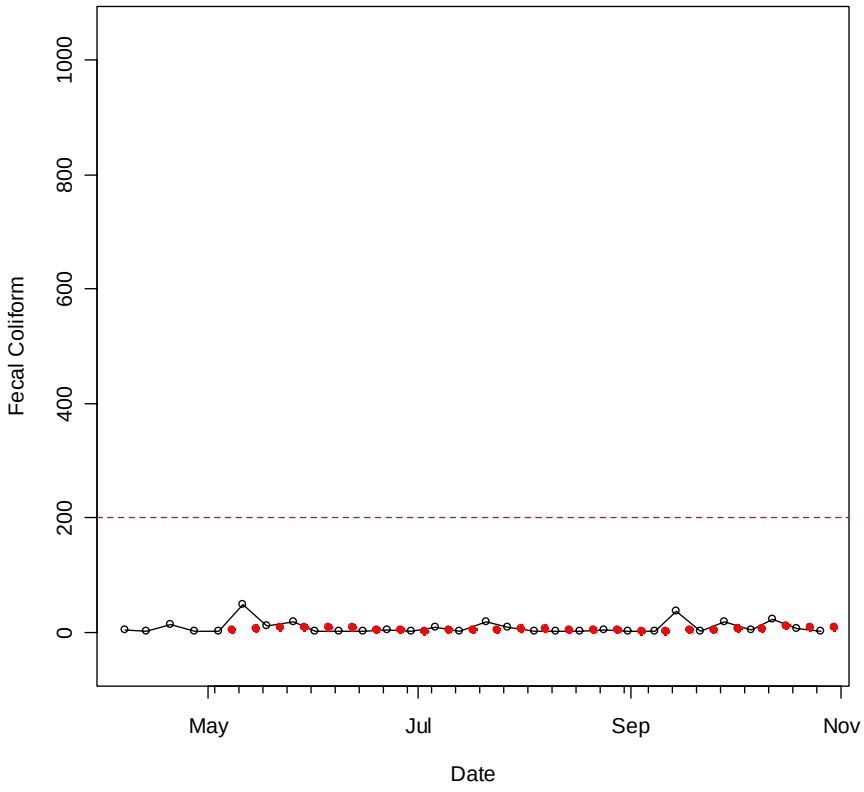


Figure B.25. Time series of sample results collected during 2009 at LTFL1.

A



B

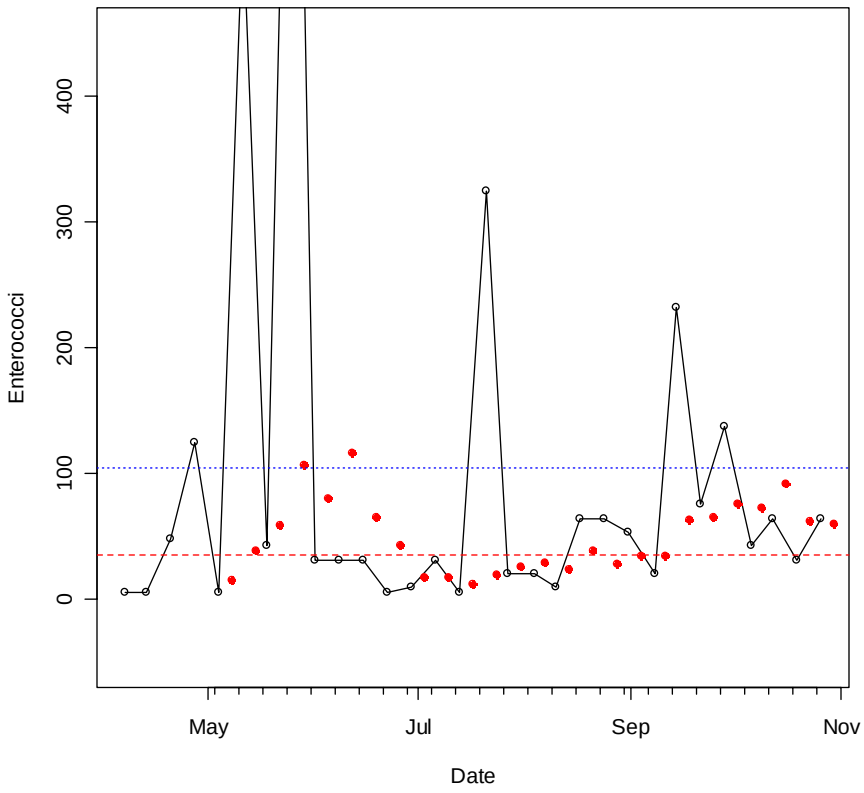
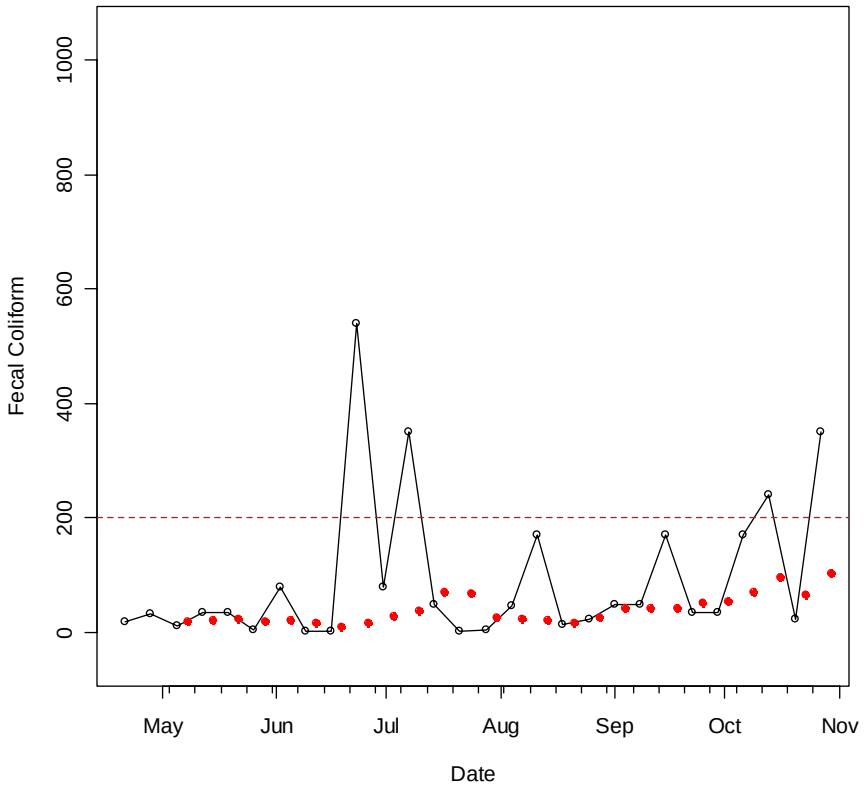


Figure B.26. Time series of sample results collected during 2009 at MART1.

A



B

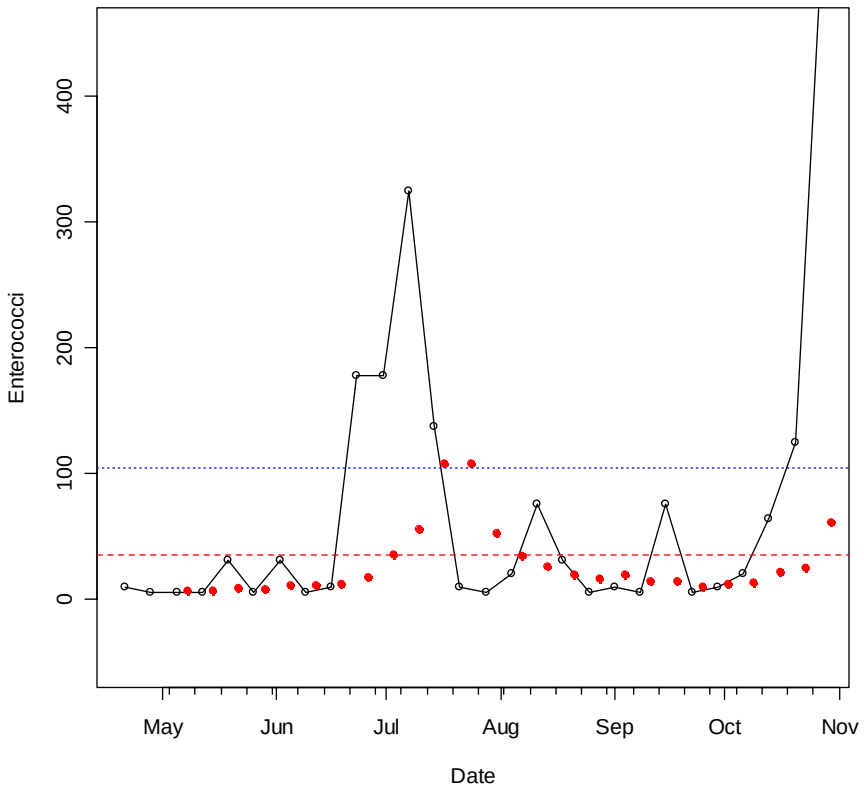
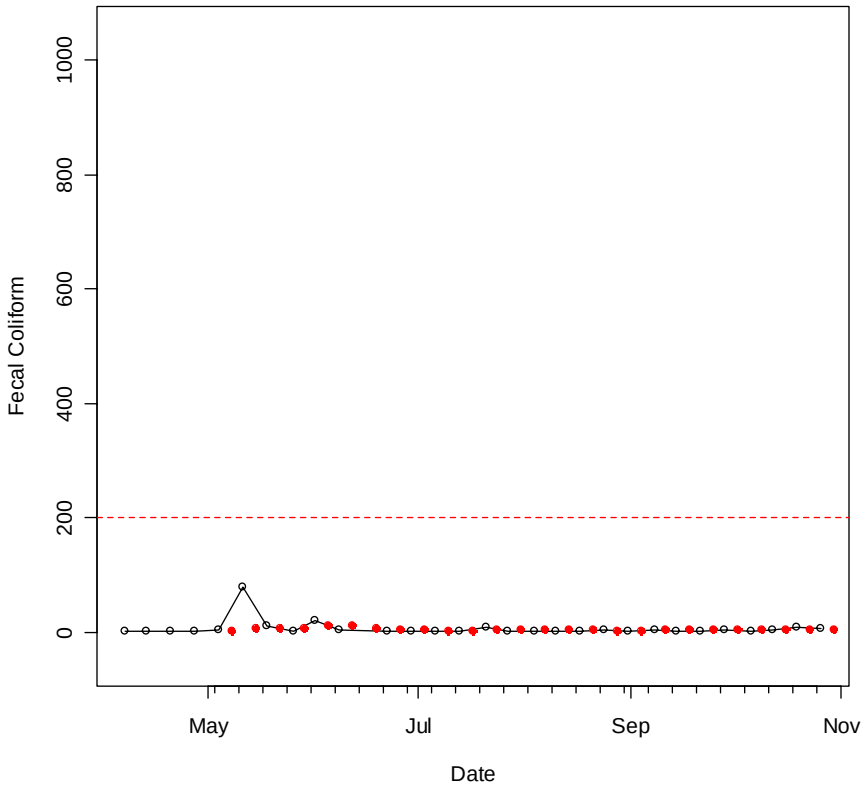


Figure B.27. Time series of sample results collected during 2009 at PONT1.

A



B

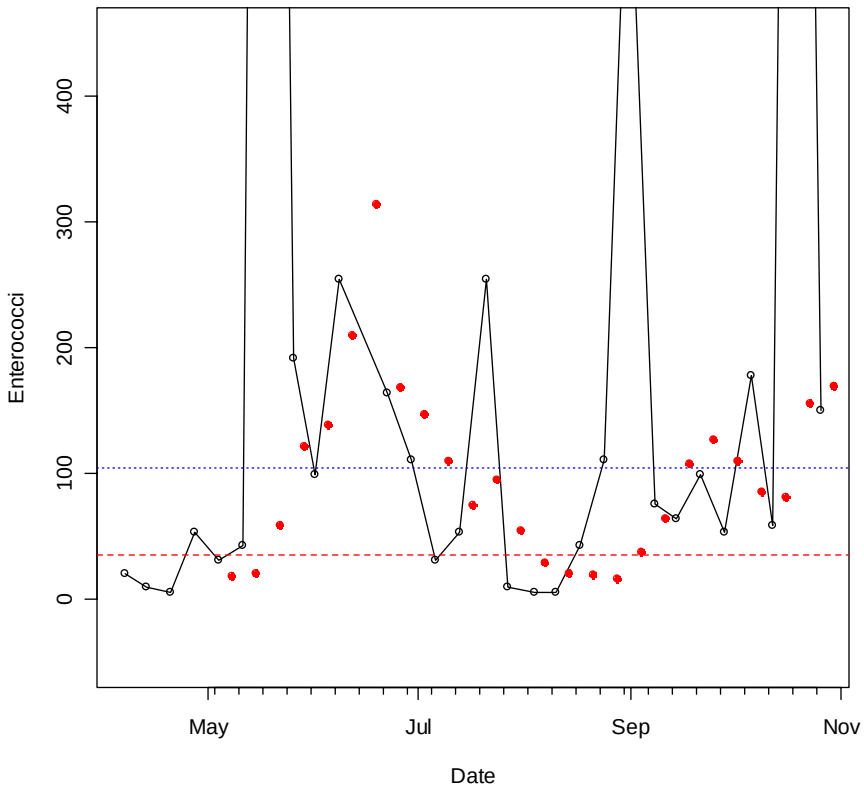


Figure B.28. Time series of sample results collected during 2009 at RUTH1.

APPENDIX C

Sample Results

2009 Beach Sample Results

Beach Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
Constance Beach											
CNST1			***Beach Name*** *Constance Beach*								
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	54	6.8	10	25.8	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	66	2	10	27.7	Routine
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	2	10	25.4	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	2	31	26.1	Routine
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	2	429	12.5	Routine
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	2	271	11.4	Routine
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	76	1.8	271	16.3	Field Split
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	76	4	624	16.3	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	9.2	782	31.1	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	87	31.0	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	831	24.3	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	10	28.6	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	9.3	137	30.8	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	10	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	7.8	53	31.1	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	10	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	7.8	271	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	5	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	2	5	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	64	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	5	32.9	Field Split
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	5	31.4	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	87	28.5	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	87	28.5	Field Split
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	33	10	28.9	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	2	5	30.3	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	6.1	75	24.5	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	4.5	87	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	4.5	20	35.0	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	13	10	26.3	Routine
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	2	178	24.6	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	99	26.0	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	7.8	87	32.8	Routine
Cypremort Point State Park											
CYPT1	***Beach Name*** *Cypremort Point State Park*										
	4/6/2009	7:20	Low Tide	Clear	North	Moderate-Strong (15-20	58	79	124	2.1	Field Split
	4/6/2009	7:20	Low Tide	Clear	North	Moderate-Strong (15-20	58	70	178	2.1	Routine
	4/13/200	7:15	Low Tide Falling	Cloudy	Calm	Calm (0 mph)	63	33	42	2.9	Routine
	4/20/200	7:15	Low Tide	Clear	North	Moderate (10-15 mph)	66	79	192	3.3	Routine
	4/27/200	7:07	High Tide	Partly Cloudy	South	Moderate-Strong (15-20	70	22	20	3.1	Routine
	5/4/2009	7:30	High Tide Falling	Mist	South	Strong (20-35 mph)	76	33	111	2.5	Routine
	5/11/200	7:30	High Tide	Clear	East-Southeast	Light (0-5 mph)	80	11	5	2.1	Routine
	5/18/200	7:15	Low Tide Falling	Clear	North	Moderate (10-15 mph)	74	4	20	2.6	Routine
	5/26/200	7:15	High Tide	Partly Cloudy	Southeast	Light (0-5 mph)	78	33	192	2.7	Routine
	6/1/2009	7:20	Low Tide Falling	Clear	Northeast	Moderate-Light (5-10 mph)	79	2	31	2.6	Routine
	6/1/2009	7:20	Low Tide Falling	Clear	Northeast	Moderate-Light (5-10 mph)	79	2	87	2.5	Field Split
	6/8/2009	7:05	High Tide	Clear	South	Moderate-Light (5-10 mph)	80	7.8	222	2.3	Routine
	6/15/200	7:17	Low Tide Falling	Clear	Southwest	Moderate (10-15 mph)	82	17	5	1.4	Routine
	6/22/200	7:20	High Tide	Scattered	South-Southwes	Moderate (10-15 mph)	84	49	1013	2.1	Routine
	6/29/200	7:15	Low Tide Falling	Clear	West-Southwest	Moderate-Strong (15-20	85	79	1184	2.0	Routine
	7/6/2009	7:15	High Tide	Scattered	South	Moderate-Strong (15-20	85	34	1652	3.6	Routine
	7/13/200	7:15	High Tide	Clear	Southwest	Moderate (10-15 mph)	86	4.5	885	10.3	Routine
	7/20/200	7:10	High Tide	Clear	Calm	Strong (20-35 mph)	84	2	42	12.5	Routine
	7/27/200	7:12	Low Tide Falling	Cloudy	North	Light (0-5 mph)	85	2	31	8.7	Routine
	8/3/2009	7:13	High Tide	Scattered	South	Moderate-Light (5-10 mph)	83	2	20	6.4	Routine
	8/10/200	7:14	High Tide Falling	Scattered	East-Southeast	Light (0-5 mph)	86	4.5	31	8.9	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	8/10/200	7:14	High Tide Falling	Scattered	East-Southeast	Light (0-5 mph)	86	7.8	31	9.2	Field Duplicate
	8/17/200	7:13	High Tide	Scattered	South	Light (0-5 mph)	85	7.8	75	11.6	Routine
	8/24/200	7:12	Low Tide Falling	Clear	North-Northeast	Light (0-5 mph)	82	7.8	42	10.9	Routine
	8/31/200	7:11	Low Tide Falling	Cloudy	North-Northeast	Moderate-Light (5-10 mph)	82	23	99	9.7	Routine
	9/8/2009	7:15	High Tide Falling	Clear	Northeast	Light (0-5 mph)	82	2	31	8.4	Routine
	9/14/200	7:15	High Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	81	540	2005	7.7	Routine
	9/21/200	7:12	High Tide	Cloudy	Calm	Calm (0 mph)	84	4.5	31	7.1	Routine
	9/28/200	7:21	High Tide	Scattered	South-Southeas		83	49	945	5.9	Routine
	9/28/200	7:21	High Tide	Scattered	South-Southeas		83	49	1445	5.7	Field Split
	10/5/200	7:20	High Tide Falling	Cloudy	South	Moderate-Light (5-10 mph)	81	23	1091	4.4	Routine
	10/12/20	7:12	High Tide Falling	Cloudy	Southeast	Moderate-Light (5-10 mph)	79	4.5	178	3.5	Routine
	10/19/20	7:17	High Tide Falling	Clear	North	Light (0-5 mph)	69	17	42	2.1	Routine
	10/19/20	7:17	High Tide Falling	Clear	North	Light (0-5 mph)	69	6.8	20	2.4	Field Split
	10/26/20	7:20	High Tide Falling	Cloudy	Northeast	Moderate-Light (5-10 mph)	66	79	831	2.4	Routine
Fontainebleau State Park											
FNTB1			***Beach Name*** *Fontainebleau State Park*								
	4/21/200	10:28	High Tide	Clear	Southwest	Moderate-Light (5-10 mph)	69	350	10	3.8	Routine
	4/28/200	9:10	Low Tide	Cloudy	Southeast	Moderate-Light (5-10 mph)	73	33	42	4.4	Routine
	5/5/2009	9:15	Low Tide		Southwest	Light (0-5 mph)	78	7.8	5	4.0	Routine
	5/12/200	9:35	Low Tide	Partly Cloudy	South	Light (0-5 mph)	84	7.8	5	3.3	Routine
	5/19/200	10:00	High Tide Rising	Clear	East	Moderate (10-15 mph)	75	7.8	5	4.4	Routine
	5/26/200	9:00	High Tide	Partly Cloudy	South	Light (0-5 mph)	77	130	31	3.9	Routine
	6/2/2009	9:20	Low Tide Falling	Partly Cloudy	East	Moderate-Light (5-10 mph)	80	2	31	3.9	Routine
	6/9/2009	9:30	Low Tide Falling	Clear	South	Calm (0 mph)	76	33	10	3.9	Routine
	6/16/200	9:20	Normal	Clear	West	Light (0-5 mph)	85	4.5	10	3.4	Routine
	6/23/200	9:00	Normal	Partly Cloudy	West	Calm (0 mph)	85	17	5	2.8	Routine
	6/30/200	9:15	Low Tide Falling	Partly Cloudy	Southwest	Light (0-5 mph)	84	13	10	3.2	Routine
	7/7/2009	9:45	Normal	Rain	West	Strong (20-35 mph)	80	140	111	2.5	Routine
	7/14/200	9:30	High Tide Rising	Scattered	West-Northwest	Moderate-Light (5-10 mph)	86.5	33	10	3.7	Routine
	7/21/200	9:20	Low Tide	Scattered	South	Moderate (10-15 mph)	81	4.5	31	3.9	Routine
	7/28/200	9:15	High Tide Rising	Cloudy	South	Moderate-Light (5-10 mph)	82.6	4.5	5	3.8	Routine
	8/4/2009	9:35	Low Tide Falling	Partly Cloudy	South	Light (0-5 mph)	84.6	220	20	3.6	Routine
	8/11/200	9:40	High Tide		Southeast		86	7.8	5	3.9	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	8/18/200	9:30	Low Tide Falling	Cloudy	Southeast	Moderate-Light (5-10 mph)	84.6	79	10	5.1	Routine
	8/25/200	9:00	High Tide Rising	Clear	East	Calm (0 mph)	80.8	2	5	5.1	Routine
	9/1/2009	10:00	Low Tide	Scattered	North	Light (0-5 mph)	81	20	5	5.0	Routine
	9/8/2009	9:40	High Tide			Calm (0 mph)	82.5	2	5	4.9	Routine
	9/15/200	9:00	Low Tide Falling	Cloudy	South	Moderate-Light (5-10 mph)	81.3	350	164	4.9	Routine
	9/22/200	9:00	High Tide	Scattered	Southeast	Light (0-5 mph)	85.1	17	5	4.4	Routine
	9/29/200	9:40	Low Tide Falling	Sleet	East	Light (0-5 mph)	80.6	4	5	4.5	Routine
	10/6/200	9:00	High Tide		South	Moderate-Light (5-10 mph)	80.2	170	10	4.9	Routine
	10/13/20	9:30	Low Tide Falling			Calm (0 mph)	78.8	23	5	4.5	Routine
	10/20/20	9:10	High Tide	Clear	East	Moderate-Light (5-10 mph)	65.8	11	5	3.5	Routine
	10/27/20	9:20	High Tide Rising	Rain	Southeast	Moderate (10-15 mph)	66	7.8	10	4.2	Routine
Fourchon											
FOUR1			***Beach Name*** *Fourchon - 1*								
	4/28/200	7:09	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	75	2	5	17.4	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	7.8	31	19.7	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	6.8	10	18.9	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	4.5	31	16.8	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	23	5	27.6	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	2	5	24.0	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	2	5	20.7	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	2	75	25.1	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	7.8	137	23.3	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	49	831	29.6	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	80	79	1091	34.7	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	82	13	5	24.2	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	23	99	26.6	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	82	4.5	150	33.2	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	84	4.5	10	30.5	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	2	5	21.3	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	23	111	17.1	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	78	2	10	21.2	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	78	7.8	5	20.7	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	7.8	5	21.5	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	9/14/200	7:14	Extremely High	Partly Cloudy	South-Southwes	Moderate (10-15 mph)	79	33	99	24.1	Field Split
	9/14/200	7:14	Extremely High	Partly Cloudy	South-Southwes	Moderate (10-15 mph)	79	79	31	23.1	Routine
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	82	2	10	22.1	Routine
	9/29/200	7:14	High Tide	Scattered	East-Northeast	Moderate-Strong (15-20	76	4.5	20	31.3	Routine
	10/6/200	6:55	Low Tide Falling	Clear	South	Light (0-5 mph)	79	4.5	5	25.2	Routine
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	2	10	19.2	Routine
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	2	20	19.3	Field Duplicate
	10/20/20	7:12	Extremely Low	Scattered	Northeast	Moderate-Light (5-10 mph)	66	2	5	25.3	Routine
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	11	5	25.8	Routine
Fourchon											
FOUR2			***Beach Name*** *Fourchon - 2*								
	4/28/200	7:09	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	75	2	5	17.3	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	4.5	10	20.8	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	4.5	5	19.0	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	4	5	17.1	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	23	5	27.2	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	2	5	24.8	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	2	5	22.8	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	7.8	31	24.9	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	2	164	23.1	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	1.3	1091	29.7	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	80	49	1184	34.8	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	82	6.8	20	30.1	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	2	5	27.7	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	82	7.8	31	33.1	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	84	2	10	31.4	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	2	5	21.1	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	2	10	21.2	Field Split
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	33	87	17.5	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	78	2	5	21.5	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	78	33	5	20.9	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	2	20	21.5	Routine
	9/14/200	7:14	Extremely High	Partly Cloudy	South-Southwes	Moderate (10-15 mph)	79	23	10	24.0	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	82	2	5	22.2	Routine
	9/29/200	7:14	High Tide	Scattered	East-Northeast	Moderate-Strong (15-20	76	4.5	5	31.5	Routine
	10/6/200	6:55	Low Tide Falling	Clear	South	Light (0-5 mph)	79	2	5	25.3	Routine
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	2	5	19.2	Routine
	10/20/20	7:12	Extremely Low	Scattered	Northeast	Moderate-Light (5-10 mph)	66	2	5	25.4	Routine
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	7.8	10	25.0	Routine
Fourchon											
FOUR3			***Beach Name*** *Fourchon - 3*								
	4/28/200	7:09	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	75	2	10	17.4	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	2	5	20.7	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	2	5	18.8	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	2	5	17.2	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	17	5	26.3	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	2	5	23.3	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	11	10	22.9	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	2	31	24.9	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	2	192	23.3	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	4.5	478	29.7	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	80	110	1652	35.0	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	82	13	10	32.5	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	2	5	27.8	Field Split
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	4	5	27.8	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	82	23	10	33.1	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	84	7.8	5	30.5	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	4.5	87	21.2	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	49	254	17.5	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	78	4.5	20	21.0	Field Split
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	78	2	20	21.5	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	78	240	10	21.5	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	2	10	21.7	Routine
	9/14/200	7:14	Extremely High	Partly Cloudy	South-Southwes	Moderate (10-15 mph)	79	23	53	24.1	Routine
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	82	2	5	22.3	Routine
	9/29/200	7:14	High Tide	Scattered	East-Northeast	Moderate-Strong (15-20	76	2	10	31.7	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	10/6/200	6:55	Low Tide Falling	Clear	South	Light (0-5 mph)	79	2	5	25.3	Field Split
	10/6/200	6:55	Low Tide Falling	Clear	South	Light (0-5 mph)	79	2	10	25.2	Routine
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	2	10	19.3	Routine
	10/20/20	7:12	Extremely Low	Scattered	Northeast	Moderate-Light (5-10 mph)	66	4.5	5	26.0	Routine
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	6.8	53	29.6	Field Duplicate
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	7.8	5	28.6	Routine
Fourchon											
FOUR4	***Beach Name*** *Fourchon - 4*										
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	13	5	18.6	Field Duplicate
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	4.5	5	18.6	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	2	99	24.9	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	82	11	10	32.1	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	2	5	22.3	Routine
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	82	23	5	22.5	Routine
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	82	2	10	22.5	Field Duplicate
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	4.5	10	19.4	Routine
Grand Isle Beach											
GIB1	***Beach Name*** *Grand Isle Beach - 1*										
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	64	2	5	27.5	Routine
	4/28/200	7:09	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	75	4.5	31	15.2	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	49	5	16.3	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	4.5	5	13.8	Field Duplicate
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	7.8	5	13.9	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	7.8	53	9.7	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	17	64	23.8	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	2	5	17.5	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	33	5	11.7	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	7.8	20	20.0	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	6.8	99	19.8	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	4.5	87	27.5	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	80	4.5	99	32.9	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	84	2	31	28.0	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	170	64	24.7	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	2	64	31.2	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	86	2	5	28.7	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	7.8	5	16.1	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	23	75	14.7	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	80	2	10	19.6	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	79	6.8	5	19.1	Field Split
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	79	45	5	19.0	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	2	31	17.8	Routine
	9/14/200	7:14	Extremely High	Partly Cloudy	South-Southwes	Moderate (10-15 mph)	80	33	42	20.9	Routine
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	84	2	5	19.4	Routine
	9/29/200	7:14	High Tide	Scattered	East-Northeast	Moderate-Strong (15-20	78	2	5	27.1	Field Split
	9/29/200	7:14	High Tide	Scattered	East-Northeast	Moderate-Strong (15-20	78	2	10	27.0	Routine
	10/6/200	6:55	Low Tide Falling	Clear	South	Light (0-5 mph)	79	4.5	20	26.6	Routine
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	7.8	10	17.3	Routine
	10/20/20	7:12	Extremely Low	Scattered	Northeast	Moderate-Light (5-10 mph)	66	4.5	10	28.2	Routine
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	23	5	28.0	Routine
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	13	10	27.2	Field Split
Grand Isle Beach											
GIB2	***Beach Name*** *Grand Isle Beach - 2*										
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	64	2	5	26.4	Field Duplicate
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	64	2	5	26.4	Routine
	4/28/200	7:09	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	75	2	20	14.8	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	33	31	18.0	Field Duplicate
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	79	99	18.0	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	11	5	13.5	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	2	10	10.7	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	33	10	23.3	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	2	42	17.8	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	33	42	22.2	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	7.8	10	20.2	Field Duplicate
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	7.8	31	20.2	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	2	64	20.6	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	4.5	5	27.6	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	80	7.8	137	34.0	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	84	2	5	28.6	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	23	5	25.1	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	7.8	42	31.6	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	86	2	5	29.2	Field Duplicate
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	86	2	5	29.1	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	2	5	15.9	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	46	238	14.6	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	79	7.8	64	18.2	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	79	17	31	19.3	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	7.8	5	18.0	Routine
	9/14/200	7:14	Extremely High	Partly Cloudy	South-Southwes	Moderate (10-15 mph)	80	23	31	20.9	Routine
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	84	4	31	20.0	Routine
	9/29/200	7:14	High Tide	Scattered	East-Northeast	Moderate-Strong (15-20	77	2	20	28.6	Routine
	10/6/200	6:55	Low Tide Falling	Clear	South	Light (0-5 mph)	79	2	5	26.8	Routine
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	33	137	18.0	Routine
	10/20/20	7:12	Extremely Low	Scattered	Northeast	Moderate-Light (5-10 mph)	66	23	87	27.2	Routine
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	7.8	5	28.6	Routine
Grand Isle Beach											
GIB3			***Beach Name*** *Grand Isle Beach - 3*								
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	64	2	10	26.3	Routine
	4/28/200	7:09	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	75	2	5	15.7	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	23	5	20.3	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	4.5	5	13.8	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	2	20	12.3	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	17	20	23.2	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	11	10	17.7	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	2	42	12.6	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	2	10	20.2	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	2	99	23.1	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	2	5	28.3	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	80	23	5	34.5	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	84	2	5	29.0	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	23	75	25.3	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	2	10	32.1	Field Duplicate
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	2	5	32.1	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	86	2	5	29.3	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	89	2	5	17.0	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	13	5	14.6	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	79	4.5	10	19.7	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	79	2	5	19.7	Field Duplicate
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	79	46	238	19.7	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	2	10	19.2	Routine
	9/14/200	7:14	Extremely High	Partly Cloudy	South-Southwes	Moderate (10-15 mph)	80	49	20	21.3	Routine
	9/22/200	6:52	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	84	11	5	20.5	Routine
	9/29/200	7:14	High Tide	Scattered	East-Northeast	Moderate-Strong (15-20	77	4.5	10	29.6	Routine
	10/6/200	6:55	Low Tide Falling	Clear	South	Light (0-5 mph)	79	2	5	26.0	Routine
	10/12/20	7:12	High Tide Rising	Scattered	Southeast	Light (0-5 mph)	78	7.8	10	18.2	Routine
	10/20/20	7:12	Extremely Low	Scattered	Northeast	Moderate-Light (5-10 mph)	66	7.8	31	27.4	Routine
	10/27/20	7:28	High Tide	Light Rain	East-Southeast	Moderate (10-15 mph)	68	13	20	29.8	Routine
Grand Isle State Park											
GISP1	***Beach Name*** *Grand Isle State Park - 1*										
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	64	2	10	28.3	Routine
	4/28/200	7:19	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	74	33	10	16.0	Field Duplicate
	4/28/200	7:19	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	74	4.5	5	15.9	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	140	5	13.8	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	430	31	12.4	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	4.5	20	8.4	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	33	20	21.6	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	2	5	12.4	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	23	10	10.9	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	110	10	11.0	Field Split
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	33	20	18.8	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	130	10	18.6	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	46	64	26.7	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	82	33	591	31.1	Field Split
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	82	7.8	364	31.1	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	84	13	5	22.0	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	49	164	24.6	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	4	10	28.3	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	85	130	87	27.5	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	87	2	5	14.6	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	350	1184	15.7	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	80	13	5	19.7	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	79	49	10	19.0	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	2	10	18.4	Routine
Grand Isle State Park											
GISP2			***Beach Name*** *Grand Isle State Park - 2*								
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	64	2	5	28.1	Routine
	4/28/200	7:19	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	74	31	5	16.2	Routine
	4/28/200	7:19	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	74	13	5	16.2	Field Duplicate
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	79	20	13.9	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	130	5	14.0	Field Split
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	23	5	12.4	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	23	10	8.4	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	49	10	21.7	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	1.8	5	13.0	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	70	10	10.9	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	6.8	10	18.3	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	79	20	18.8	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	23	87	26.8	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	82	23	306	31.2	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	84	7.8	10	22.5	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	79	222	24.3	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	4.5	5	28.3	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	85	79	99	27.6	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	87	4.5	5	14.6	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	540	453	15.9	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	80	7.8	10	19.7	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	79	23	31	19.0	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	11	10	18.3	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	82	2	20	18.3	Field Duplicate
Grand Isle State Park											
GISP3	***Beach Name*** *Grand Isle State Park - 3*										
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	64	7.8	10	28.9	Routine
	4/28/200	7:19	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	74	49	20	16.2	Routine
	4/28/200	7:19	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	74	23	5	16.2	Field Duplicate
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	70	10	14.0	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	1600	31	12.6	Field Split
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	1600	42	12.6	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	4.5	5	8.3	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	33	10	21.8	Routine
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	6.8	5	14.9	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	70	20	11.1	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	33	10	19.0	Routine
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	49	42	18.9	Field Split
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	110	87	18.9	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	33	75	27.1	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	82	23	271	31.3	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	84	49	99	24.3	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	130	1184	24.6	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	2	10	28.8	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	85	79	64	27.8	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	87	7.8	5	13.0	Routine
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	350	192	16.1	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	78	33	10	18.5	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	77	170	150	18.8	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	81	23	20	18.0	Routine
Grand Isle State Park											
GISP4	***Beach Name*** *Grand Isle State Park - 4*										

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	4/21/200	6:32	Normal	Clear	Northwest	Light (0-5 mph)	62	4.5	10	27.5	Routine
	4/28/200	7:09	High Tide Rising	Scattered	South-Southeas	Moderate (10-15 mph)	74	350	20	16.1	Routine
	5/5/2009	6:00	Normal	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	540	53	14.1	Routine
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	1600	137	12.6	Field Duplicate
	5/12/200	6:26	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	82	1600	124	12.6	Routine
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	7.8	5	8.4	Field Duplicate
	5/18/200	6:12	Normal	Scattered	North-Northeast	Strong (20-35 mph)	70	2	5	8.3	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	33	31	21.8	Routine
	5/26/200	6:08	High Tide Rising	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	49	10	21.8	Field Duplicate
	6/1/2009	6:07	Low Tide	Clear	Southeast	Light (0-5 mph)	79	2	5	16.1	Routine
	6/9/2009	6:23	High Tide Rising	Scattered	South	Light (0-5 mph)	80	79	10	11.0	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	280	10	19.1	Routine
	6/16/200	6:08	High Tide Rising	Scattered	South	Light (0-5 mph)	80	210	5	19.1	Field Duplicate
	6/22/200	6:32	High Tide Rising	Scattered	West	Light (0-5 mph)	85	33	75	19.0	Routine
	6/29/200	6:18	Normal	Partly Cloudy	West-Southwest	Light (0-5 mph)	82	79	99	27.2	Routine
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	82	23	306	31.2	Field Split
	7/7/2009	6:20	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	82	23	271	31.3	Routine
	7/14/200	6:28	Normal	Cloudy	West-Southwest	Light (0-5 mph)	84	33	124	25.8	Routine
	7/21/200	6:38	Extremely High	Scattered	Southeast	Light (0-5 mph)	82	240	2005	24.7	Routine
	7/27/200	7:23	Normal	Partly Cloudy	South	Light (0-5 mph)	84	4.5	10	29.0	Routine
	8/4/2009	6:36	High Tide Rising	Clear	Calm	Calm (0 mph)	85	110	99	27.8	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	87	7.8	5	15.1	Routine
	8/10/200	6:40	Normal	Light Rain	Southeast	Light (0-5 mph)	87	4.5	5	15.0	Field Duplicate
	8/18/200	6:23	Extremely High	Rain	South	Light (0-5 mph)	85	350	324	16.1	Routine
	8/25/200	6:55	Low Tide Falling	Clear	Calm	Calm (0 mph)	78	79	20	18.3	Routine
	9/1/2009	6:43	High Tide Rising	Cloudy	Northeast	Moderate-Light (5-10 mph)	77	49	164	18.9	Routine
	9/8/2009	7:02	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	81	4.5	10	18.1	Routine
Gulf Breeze											
GBRZ1			***Beach Name*** *Gulf Breeze*								
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	54	2	5	25.6	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	66	2	5	27.9	Routine
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	4.5	10	26.0	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	4.5	87	26.3	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	2	222	12.5	Routine
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	6.8	1445	11.6	Routine
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	76	6.8	478	16.3	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	2	531	31.2	Field Duplicate
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	4.5	531	31.0	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	42	31.4	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	831	24.9	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	5	28.4	Field Split
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	20	28.0	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	17	10	30.7	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	20	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	1.8	53	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	5	35.0	Field Duplicate
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	31	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	79	192	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	20	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	7.8	31	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	10	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	20	33.7	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	64	28.7	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	13	20	28.4	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	2	5	30.6	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	124	24.4	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	2	53	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	4.5	75	35.0	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	2	5	26.7	Routine
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	7.8	178	24.2	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	1.8	64	28.5	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	6.1	124	31.0	Routine
Holly Beach											
HOLLY1	***Beach Name*** *Holly Beach - 1*										
	4/7/2009	9:00	Low Tide	Clear	Northwest	Moderate (10-15 mph)	54	2	5	26.6	Routine
	4/13/200	9:00	Normal	Cloudy	South-Southeas	Moderate (10-15 mph)	66	2	10	24.3	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	4/20/200	8:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	66	2	20	21.1	Routine
	4/27/200	8:45	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	7.8	87	22.8	Routine
	5/4/2009	8:45	Low Tide	Cloudy	Northwest	Moderate-Light (5-10 mph)	75	2	42	12.3	Routine
	5/11/200	8:00	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	21	137	9.7	Routine
	5/18/200	9:15	Normal	Clear	North-Northeast	Moderate (10-15 mph)	72	4	782	22.8	Routine
	5/18/200	9:15	Normal	Clear	North-Northeast	Moderate (10-15 mph)	72	2	697	22.8	Field Split
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	13	1184	30.2	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	5	31.2	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	111	24.5	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	1.8	124	28.5	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	23	164	29.6	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	31	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	42	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	5	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	6.8	87	35.0	Field Duplicate
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	23	53	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	6.8	20	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	17	5	35.0	Field Duplicate
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	7.8	20	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	4	20	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	20	31.3	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	288	31.4	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	80	23	64	26.8	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	23	1091	30.2	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	23	207	23.5	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	33	42	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	7.8	64	33.8	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	23	31	23.2	Routine
	10/12/20	8:45	Normal	Partly Cloudy	East	Light (0-5 mph)	75	4.5	222	25.2	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	99	24.9	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	2	64	25.3	Routine

Holly Beach

HOLLY2 ***Beach Name*** *Holly Beach - 2*

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	4/7/2009	9:00	Low Tide	Clear	Northwest	Moderate (10-15 mph)	54	4.5	31	26.5	Routine
	4/13/200	9:00	Normal	Cloudy	South-Southeas	Moderate (10-15 mph)	66	2	10	22.6	Routine
	4/20/200	8:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	66	2	42	20.7	Routine
	4/27/200	8:45	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	2	99	22.8	Routine
	5/4/2009	8:45	Low Tide	Cloudy	Northwest	Moderate-Light (5-10 mph)	75	4.5	31	11.7	Routine
	5/11/200	8:00	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	13	344	9.6	Routine
	5/18/200	9:15	Normal	Clear	North-Northeast	Moderate (10-15 mph)	72	4.5	1652	22.9	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	33	1445	30.6	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	20	29.8	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	75	24.2	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	4.5	99	28.5	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	7.8	75	29.3	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	20	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	42	34.7	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	4.5	20	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	13	53	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	10	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	17	5	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	7.8	20	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	4.5	64	31.1	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	288	31.2	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	80	13	64	26.3	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	2	178	30.0	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	23	192	23.7	Field Split
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	22	207	23.7	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	49	42	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	23	192	34.0	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	17	42	24.1	Routine
	10/12/20	8:45	Normal	Partly Cloudy	East	Light (0-5 mph)	75	1.8	75	24.5	Routine
	10/12/20	8:45	Normal	Partly Cloudy	East	Light (0-5 mph)	75	7.8	192	25.3	Field Duplicate
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	137	27.6	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	2	31	29.5	Routine

Holly Beach

Beach Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
HOLLY3			***Beach Name*** *Holly Beach - 3*								
	4/7/2009	9:00	Low Tide	Clear	Northwest	Moderate (10-15 mph)	54	2	5	26.2	Routine
	4/13/200	9:00	Normal	Cloudy	South-Southeas	Moderate (10-15 mph)	66	2	5	26.8	Routine
	4/20/200	8:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	66	13	10	21.1	Routine
	4/27/200	8:45	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	6.8	164	22.9	Routine
	5/4/2009	8:45	Low Tide	Cloudy	Northwest	Moderate-Light (5-10 mph)	75	11	31	11.6	Routine
	5/11/200	8:00	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	79	178	9.8	Routine
	5/18/200	9:15	Normal	Clear	North-Northeast	Moderate (10-15 mph)	72	4.5	2005	23.1	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	17	2005	30.7	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	20	30.8	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	4.5	31	24.8	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	4.5	137	28.3	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	7.8	192	29.3	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	31	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	42	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	5	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	220	697	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	64	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	13	20	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	20	34.6	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	17	64	31.2	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	164	31.9	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	80	79	222	27.0	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	43	75	29.9	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	17	364	23.9	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	4.5	75	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	4.5	64	33.8	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	7.8	31	24.4	Field Split
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	4.5	20	24.5	Routine
	10/12/20	8:45	Normal	Partly Cloudy	East	Light (0-5 mph)	75	6.8	87	24.9	Routine
	10/12/20	8:45	Normal	Partly Cloudy	East	Light (0-5 mph)	75	2	53	25.6	Field Split
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	238	24.9	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	2	5	29.9	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
Holly Beach											
HOLLY4	***Beach Name***	*Holly Beach - 4*									
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	54	2	10	26.4	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	66	2	5	28.7	Routine
	4/20/200	8:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	66	4.5	20	19.6	Routine
	4/20/200	8:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	66	7.8	31	16.3	Field Split
	4/27/200	8:45	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	2	137	23.1	Routine
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	6.8	31	11.9	Routine
	5/11/200	8:00	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	110	222	10.0	Routine
	5/18/200	9:15	Normal	Clear	North-Northeast	Moderate (10-15 mph)	72	33	1652	22.9	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	17	1652	30.7	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	5	30.9	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	87	24.6	Field Split
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	87	24.8	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	254	26.7	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	70	137	29.5	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	64	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	20	35.0	Field Duplicate
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	31	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	10	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	79	504	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	31	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	20	35.0	Field Duplicate
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	17	20	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	31	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	11	42	30.9	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	64	31.1	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	80	33	53	27.3	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	6.8	20	30.0	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	33	178	23.9	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	23	64	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	4.5	64	33.9	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	4.5	5	24.5	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	11	164	25.3	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	75	24.7	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	2	99	27.3	Routine
Holly Beach											
HOLLY5			***Beach Name***	*Holly Beach - 5*							
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	54	2	10	26.6	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	66	2	5	28.7	Routine
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	2	5	20.7	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	4.5	137	24.6	Routine
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	13	53	11.1	Routine
	5/11/200	8:00	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	49	288	10.1	Routine
	5/11/200	8:00	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	49	192	10.1	Field Duplicate
	5/18/200	9:15	Normal	Clear	North-Northeast	Moderate (10-15 mph)	72	4.5	2005	22.6	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	240	1298	30.6	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	20	31.1	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	4	137	24.1	Field Split
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	222	24.8	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	238	27.9	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	7.8	87	29.3	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	31	29.1	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	1.8	10	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	20	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	540	624	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	10	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	79	31	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	4.5	53	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	4	10	30.8	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	1.8	111	30.9	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	110	111	27.9	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	4.5	64	30.1	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	23	659	23.8	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	70	53	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	11	99	32.7	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	2	10	24.9	Routine
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	2	75	25.2	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	137	24.8	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	124	24.7	Field Split
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	2	53	32.7	Routine
Holly Beach											
HOLLY6	***Beach Name*** *Holly Beach - 6*										
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	54	2	5	26.2	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	66	2	10	28.5	Routine
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	2	75	21.1	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	7.8	192	24.9	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	2	150	24.3	Field Duplicate
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	17	75	11.5	Routine
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	79	306	10.2	Routine
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	73	7.8	1652	22.6	Routine
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	73	7.8	1652	23.0	Field Split
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	14	1445	31.1	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	20	31.8	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	11	306	24.6	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	271	28.1	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	49	137	29.2	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	87	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	87	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	31	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	240	124	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	10	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	21	42	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	31	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	4.5	31	31.1	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	75	30.6	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	80	170	53	28.2	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	2	20	30.0	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	6.8	164	23.8	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	31	53	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	11	87	34.0	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	2	20	25.1	Routine
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	2	124	25.2	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	2	164	24.8	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	2	42	25.6	Routine
Little Florida											
LTFL1			***Beach Name*** *Little Florida*								
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	54	2	5	26.1	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	66	2	20	27.8	Routine
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	4.5	5	25.6	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	78	2	31	26.2	Routine
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	2	137	11.8	Routine
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	11	478	11.9	Field Split
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	23	531	12.0	Routine
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	76	13	324	16.3	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	7.8	738	30.8	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	4.5	697	30.9	Field Split
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	20	31.3	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	164	24.1	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	31	29.1	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	11	99	31.5	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	5	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	2	87	33.7	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	20	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	110	207	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	5	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	11	20	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	10	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	53	33.8	Field Split
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	42	33.2	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	10	29.1	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	4.5	53	28.9	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	3.7	5	30.5	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	13	111	24.5	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	4.5	31	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	2	53	35.0	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	13	20	27.0	Routine
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	72	4.5	99	23.8	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	4.5	20	25.7	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	23	53	31.3	Routine
Long Beach											
DUNG1	***Beach Name***		*Long Beach*								
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	52	7.8	5	25.9	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	65	2	20	27.8	Routine
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	240	124	25.2	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	2	111	25.3	Routine
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	2	10	12.2	Routine
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	49	1091	12.0	Routine
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	76	7.8	111	16.1	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	23	782	31.3	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	10	31.4	Field Split
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	10	31.1	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	13	64	25.1	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	1.8	20	28.7	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	27	75	31.6	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	5	28.6	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	222	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	31	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	13	1298	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	5	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	4.5	5	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	10	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	5	33.8	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	75	29.1	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	4.5	75	29.0	Field Duplicate

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	10	29.2	Field Duplicate
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	4.5	1184	25.7	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	2	42	30.8	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	23	150	24.4	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	2	5	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	13	53	35.0	Field Split
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	17	111	35.0	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	2	99	27.8	Routine
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	72	2	42	23.3	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	6.8	20	30.9	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	4.5	20	26.4	Routine
Martin Beach											
MART1	***Beach Name*** *Martin Beach*										
	4/7/2009	7:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	52	4.5	5	26.2	Routine
	4/13/200	7:30	Normal	Fog	South-Southeas	Moderate-Light (5-10 mph)	65	2	5	27.7	Routine
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	11	31	22.3	Field Split
	4/20/200	7:15	Low Tide	Clear	Northwest	Light (0-5 mph)	66	17	64	20.2	Routine
	4/27/200	7:50	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	2	124	24.3	Routine
	5/4/2009	7:30	Low Tide Falling	Cloudy	West-Northwest	Moderate-Light (5-10 mph)	75	2	5	12.7	Routine
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	17	697	11.6	Field Duplicate
	5/11/200	7:00	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	79	384	11.6	Routine
	5/18/200	8:00	Normal	Clear	North-Northeast	Moderate (10-15 mph)	76	11	42	15.8	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	17	945	30.7	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	78	2	31	31.5	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	2	31	25.3	Routine
	6/15/200	7:00	Low Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	80	2	31	27.1	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	4	5	31.4	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	10	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	7.8	31	35.0	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	5	35.0	Routine
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	17	324	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	7.8	20	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	2	20	35.0	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	10	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	85	2	64	34.8	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	4.5	64	29.3	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	53	28.9	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	2	20	30.5	Routine
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	49	271	23.7	Field Split
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	23	192	23.6	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	2	75	35.0	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	17	137	35.0	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	4.5	42	28.4	Routine
	10/12/20	7:30	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	72	23	64	22.8	Routine
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	6.8	31	32.1	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	2	64	25.9	Routine
North Beach											
LCNB1			***Beach Name*** *North Beach*								
	4/6/2009	10:12	Low Tide	Partly Cloudy	Northwest	Moderate (10-15 mph)		49	64	0.7	Routine
	4/6/2009	10:12	Low Tide	Partly Cloudy	Northwest	Moderate (10-15 mph)		110	64	0.7	Field Duplicate
	4/13/200	12:28	Low Tide Falling	Cloudy	South-Southwes	Moderate-Light (5-10 mph)	66	33	192	0.9	Routine
	4/13/200	12:28	Low Tide Falling	Cloudy	South-Southwes	Moderate-Light (5-10 mph)	66	46	53	1.0	Field Duplicate
	4/20/200	8:42	Low Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	64	1600	2005	1.6	Routine
	4/27/200	8:48	Low Tide Falling	Cloudy	South	Moderate (10-15 mph)	73.5	70	31	0.4	Routine
	5/4/2009	8:38	Low Tide Falling	Cloudy	North	Light (0-5 mph)	75	49	42	0.4	Routine
	5/11/200	8:05	Low Tide Falling	Partly Cloudy	South	Light (0-5 mph)	80	33	42	0.4	Routine
	5/18/200	8:22	High Tide Falling	Clear	North	Light (0-5 mph)	74	7.8	20	0.4	Routine
	5/26/200	8:33	Low Tide Falling	Partly Cloudy	South-Southwes	Light (0-5 mph)	79	110	87	4.2	Routine
	6/1/2009	8:42	High Tide Falling	Clear	South-Southwes	Light (0-5 mph)	83	2	31	7.0	Routine
	6/8/2009	8:48	High Tide Falling	Partly Cloudy	South-Southwes	Moderate-Light (5-10 mph)	81	11	87	6.3	Field Split
	6/8/2009	8:48	High Tide Falling	Partly Cloudy	South-Southwes	Moderate-Light (5-10 mph)	81	14	10	6.4	Routine
	6/15/200	8:25	Low Tide Falling	Partly Cloudy	South	Light (0-5 mph)	85	7.8	31	5.6	Routine
	6/22/200	8:28	Low Tide Falling	Scattered	Southwest	Light (0-5 mph)	86	2	5	6.3	Routine
	6/29/200	8:12	Low Tide Falling	Partly Cloudy	West	Light (0-5 mph)	87	17	164	11.5	Routine
	7/6/2009	8:40	High Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	87	4.5	53	7.3	Routine
	7/13/200	8:24	High Tide Falling	Scattered	South-Southeas	Moderate-Light (5-10 mph)	89.2	2	31	5.7	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	7/20/200	8:26	Low Tide Falling	Scattered	Southeast	Light (0-5 mph)	86	170	137	6.0	Routine
	7/27/200	8:34	Low Tide Falling	Cloudy	South-Southwes	Light (0-5 mph)	84	220	87	4.9	Field Split
	7/27/200	8:34	Low Tide Falling	Cloudy	South-Southwes	Light (0-5 mph)	84	540	111	4.9	Routine
	8/3/2009	8:28	High Tide Falling	Partly Cloudy	South	Light (0-5 mph)	84.5	13	42	3.2	Routine
	8/10/200	8:30	Low Tide Falling	Scattered	South	Light (0-5 mph)	87	130	10	7.8	Field Duplicate
	8/10/200	8:30	Low Tide Falling	Scattered	South	Light (0-5 mph)	87	33	31	6.8	Routine
	8/17/200	9:08	Low Tide Falling	Scattered	East-Southeast	Light (0-5 mph)	87	920	53	13.0	Routine
	8/24/200	8:58	Low Tide Falling	Scattered	East	Light (0-5 mph)	83	22	111	10.6	Routine
	8/31/200	8:18	High Tide Falling	Cloudy	Northeast	Moderate-Light (5-10 mph)	84	240	324	12.3	Routine
	9/8/2009	7:38	Low Tide Falling	Partly Cloudy	Northeast	Light (0-5 mph)	88	22	87	12.7	Routine
	9/14/200	8:04	Low Tide Falling	Partly Cloudy	South-Southwes	Moderate-Light (5-10 mph)	83	130	738	12.4	Routine
	9/22/200	7:10	Low Tide Falling	Cloudy	South	Light (0-5 mph)	83.8	79	238	11.4	Routine
	9/28/200	8:44	Low Tide Falling	Partly Cloudy	West-Northwest	Light (0-5 mph)	84	7.8	344	12.7	Routine
	9/28/200	8:44	Low Tide Falling	Partly Cloudy	West-Northwest	Light (0-5 mph)	84	4	42	12.7	Field Split
	10/5/200	8:32	High Tide Falling	Cloudy	South-Southwes	Light (0-5 mph)	84.2	130	222	12.6	Routine
	10/12/20	8:28	High Tide Falling	Cloudy	South	Light (0-5 mph)	74.2	110	178	3.9	Routine
	10/19/20	8:32	High Tide Falling	Clear	Northeast	Light (0-5 mph)	71	49	75	3.7	Routine
	10/26/20	8:32	High Tide Falling	Cloudy	East-Southeast	Moderate (10-15 mph)	69	110	207	2.1	Routine
Pontchartrain Beach											
PONT1			***Beach Name*** *Pontchartrain Beach*								
	4/21/200	8:35	High Tide Falling	Clear	Northwest	Light (0-5 mph)	69	17	10	4.6	Routine
	4/28/200	9:40	High Tide	Partly Cloudy	East	Light (0-5 mph)	74	31	5	4.9	Routine
	5/5/2009	8:00	Low Tide	Cloudy	Calm	Calm (0 mph)	76	11	5	4.9	Routine
	5/12/200	8:30	Low Tide	Clear	Calm	Calm (0 mph)	82	33	5	5.0	Routine
	5/19/200	8:10	High Tide	Scattered	Northeast	Moderate (10-15 mph)	73	33	31	5.5	Routine
	5/26/200	9:00	High Tide	Partly Cloudy	South	Light (0-5 mph)	77	4.5	5	5.3	Routine
	6/2/2009	8:15	Low Tide	Clear	Southeast	Light (0-5 mph)	81	79	31	5.0	Routine
	6/9/2009	8:15	Low Tide	Clear	Calm	Calm (0 mph)	83	2	5	5.3	Routine
	6/16/200	7:45	Low Tide	Clear	Calm	Calm (0 mph)	87	2	10	5.0	Routine
	6/23/200	9:30	High Tide	Clear	North-Northeast	Moderate-Light (5-10 mph)	89	540	178	4.4	Routine
	6/30/200	7:00	High Tide	Clear	Northeast	Moderate-Light (5-10 mph)	89	79	178	4.5	Routine
	7/7/2009	7:00	Low Tide	Rain	Northeast	Moderate-Strong (15-20	86	350	324	5.2	Routine
	7/14/200	6:48	High Tide	Partly Cloudy	North	Moderate-Light (5-10 mph)	88	49	137	5.8	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	7/21/200	6:45	Low Tide	Clear	Calm	Calm (0 mph)	87	1.8	10	5.4	Routine
	7/28/200	7:50	Normal	Clear	Calm	Calm (0 mph)	86.4	4.5	5	5.3	Routine
	8/4/2009	7:15	Normal	Clear	Calm	Calm (0 mph)	87.8	46	20	5.5	Routine
	8/11/200	7:30	High Tide	Clear	Calm	Calm (0 mph)	88	170	75	5.0	Routine
	8/18/200	7:00	High Tide	Cloudy	Calm	Calm (0 mph)	87	13	31	5.4	Routine
	8/25/200	7:45	High Tide	Clear	Northeast	Light (0-5 mph)	85.3	23	5	6.1	Routine
	9/1/2009	8:50					83.5	49	10	6.7	Routine
	9/8/2009	9:15					84	49	5	5.6	Routine
	9/15/200	7:30	Low Tide Falling	Partly Cloudy	Northeast	Moderate-Light (5-10 mph)		170	75	5.6	Routine
	9/22/200	10:00	Low Tide	Partly Cloudy	Northeast			33	5	7.7	Routine
	9/29/200	9:27	Normal	Scattered	Southwest	Moderate-Strong (15-20		33	10	7.0	Routine
	10/6/200	6:55	Low Tide Falling	Partly Cloudy	East-Northeast		80.8	170	20	6.8	Routine
	10/13/20	8:00	Normal	Cloudy	Southwest	Moderate-Light (5-10 mph)	79.5	240	64	6.9	Routine
	10/20/20	7:00	Low Tide Falling	Clear	South-Southwes	Moderate-Light (5-10 mph)	68.7	23	124	6.5	Routine
	10/27/20	10:00	Normal	Rain	Northwest	Moderate-Strong (15-20	69.3	350	504	6.9	Routine
Rutherford Beach											
RUTH1	***Beach Name*** *Rutherford Beach*										
	4/7/2009	9:00	Low Tide	Clear	Northwest	Moderate (10-15 mph)	54	2	20	26.7	Routine
	4/13/200	9:00	Normal	Cloudy	South-Southeas	Moderate (10-15 mph)	66	2	10	24.9	Routine
	4/20/200	8:45	Low Tide	Clear	Northwest	Moderate-Light (5-10 mph)	66	2	5	21.7	Routine
	4/27/200	8:45	High Tide	Partly Cloudy	Southeast	Moderate-Strong (15-20	73	2	53	22.8	Routine
	5/4/2009	8:45	Low Tide	Cloudy	Northwest	Moderate-Light (5-10 mph)	76	4.5	31	11.0	Routine
	5/11/200	8:00	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	78	79	42	5.7	Routine
	5/18/200	9:15	Normal	Clear	North-Northeast	Moderate (10-15 mph)	72	11	2005	32.9	Routine
	5/26/200	7:30	High Tide	Partly Cloudy	South	Moderate-Light (5-10 mph)	76	2	192	27.2	Routine
	6/1/2009	7:15	High Tide Falling	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	79	21	99	30.8	Routine
	6/8/2009	7:10	High Tide Falling	Partly Cloudy	South	Moderate-Light (5-10 mph)	80	4.5	254	25.2	Routine
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	2	178	20.9	Field Duplicate
	6/22/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	83	2	150	21.3	Routine
	6/29/200	7:00	High Tide	Clear	West-Northwest	Light (0-5 mph)	84	2	111	35.0	Routine
	7/6/2009	7:20	High Tide Falling	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	1.8	31	31.5	Routine
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	53	35.0	Field Duplicate
	7/13/200	7:00	High Tide	Scattered	West-Southwest	Light (0-5 mph)	85	2	53	35.0	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	7/21/200	7:15	High Tide Rising	Partly Cloudy	South	Moderate (10-15 mph)	80	9.3	254	35.0	Routine
	7/27/200	7:00	High Tide	Cloudy	Southwest	Light (0-5 mph)	82	2	10	35.0	Routine
	8/4/2009	7:30	Normal	Scattered	South-Southwes	Light (0-5 mph)	82	2	5	35.0	Routine
	8/10/200	7:15	High Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	85	2	5	35.0	Routine
	8/17/200	7:15	High Tide	Scattered	East-Southeast	Light (0-5 mph)	86	2	42	25.6	Routine
	8/24/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	4	111	29.7	Routine
	8/31/200	7:00	High Tide Falling	Scattered	Northeast	Moderate-Light (5-10 mph)	82	2	624	35.0	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	4.5	75	24.9	Routine
	9/8/2009	7:30	Normal	Scattered	Northeast	Light (0-5 mph)	82	2	75	24.9	Field Split
	9/14/200	7:20	High Tide	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	82	2	64	17.9	Routine
	9/21/200	7:35	Normal	Scattered	South	Moderate-Light (5-10 mph)	82	2	99	30.8	Routine
	9/28/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	82	4.5	53	31.8	Routine
	10/6/200	7:45	Low Tide	Scattered	South	Moderate-Light (5-10 mph)	80	1.8	178	21.3	Routine
	10/12/20	8:45	Normal	Partly Cloudy	East	Light (0-5 mph)	75	4	64	25.8	Routine
	10/12/20	8:45	Normal	Partly Cloudy	East	Light (0-5 mph)	75	2	53	25.9	Field Duplicate
	10/19/20	8:30	Low Tide	Scattered	East-Northeast	Moderate-Light (5-10 mph)	66	7.8	1652	25.2	Routine
	10/26/20	8:00	Normal	Cloudy	East	Moderate (10-15 mph)	68	6.8	150	28.7	Routine
South Beach and Rabbit Island											
LCSB1	***Beach Name*** *South Beach and Rabbit Island*										
	4/6/2009	10:12	Low Tide	Partly Cloudy	Northwest	Moderate (10-15 mph)		70	99	1.6	Routine
	4/13/200	12:28	Low Tide Falling	Cloudy	South-Southwes	Moderate-Light (5-10 mph)	65	170	2005	2.1	Routine
	4/20/200	8:42	Low Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	64	1600	2005	2.9	Routine
	4/27/200	8:48	Low Tide Falling	Cloudy	South	Moderate (10-15 mph)	73	23	53	0.4	Routine
	5/4/2009	8:38	Low Tide Falling	Cloudy	North	Light (0-5 mph)	75	13	42	0.4	Routine
	5/11/200	8:05	Low Tide Falling	Partly Cloudy	South	Light (0-5 mph)	80	11	5	0.4	Routine
	5/18/200	8:22	High Tide Falling	Clear	North	Light (0-5 mph)	74	49	53	0.4	Routine
	5/26/200	8:33	Low Tide Falling	Partly Cloudy	South-Southwes	Light (0-5 mph)	79	110	87	5.4	Routine
	6/1/2009	8:42	High Tide Falling	Clear	South-Southwes	Light (0-5 mph)	83	13	42	4.6	Routine
	6/8/2009	8:48	High Tide Falling	Partly Cloudy	South-Southwes	Moderate-Light (5-10 mph)	81	17	10	9.3	Routine
	6/15/200	8:25	Low Tide Falling	Partly Cloudy	South	Light (0-5 mph)	85	11	5	11.3	Routine
	6/22/200	8:28	Low Tide Falling	Scattered	Southwest	Light (0-5 mph)	86	2	5	11.6	Routine
	6/29/200	8:12	Low Tide Falling	Partly Cloudy	West	Light (0-5 mph)	87	7.8	31	7.4	Routine
	7/6/2009	8:40	High Tide Falling	Partly Cloudy	Southwest	Moderate (10-15 mph)	87	4.5	31	14.3	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	7/13/200	8:24	High Tide Falling	Scattered	South-Southeas	Moderate-Light (5-10 mph)	89	13	31	11.4	Routine
	7/20/200	8:26	Low Tide Falling	Scattered	Southeast	Light (0-5 mph)	86	130	288	11.4	Routine
	7/27/200	8:34	Low Tide Falling	Cloudy	South-Southwes	Light (0-5 mph)	84	1600	2005	8.9	Routine
	8/3/2009	8:28	High Tide Falling	Partly Cloudy	South	Light (0-5 mph)	86	130	178	7.5	Routine
	8/10/200	8:30	Low Tide Falling	Scattered	South	Light (0-5 mph)	87	49	53	14.1	Routine
	8/17/200	9:08	Low Tide Falling	Scattered	East-Southeast	Light (0-5 mph)	87	33	478	19.6	Routine
	8/24/200	8:58	Low Tide Falling	Scattered	East	Light (0-5 mph)	83	23	99	19.3	Routine
	8/31/200	8:18	High Tide Falling	Cloudy	Northeast	Moderate-Light (5-10 mph)	83	540	945	17.0	Routine
	9/8/2009	7:38	Low Tide Falling	Partly Cloudy	Northeast	Light (0-5 mph)	88	23	192	18.2	Routine
	9/14/200	8:04	Low Tide Falling	Partly Cloudy	South-Southwes	Moderate-Light (5-10 mph)	83	350	324	18.4	Routine
	9/22/200	7:10	Low Tide Falling	Cloudy	South	Light (0-5 mph)	83.8	13	782	16.4	Routine
	9/28/200	8:44	Low Tide Falling	Partly Cloudy	West-Northwest	Light (0-5 mph)	84	17	87	16.7	Routine
	10/5/200	8:32	High Tide Falling	Cloudy	South-Southwes	Light (0-5 mph)	84.2	540	831	15.6	Routine
	10/12/20	8:28	High Tide Falling	Cloudy	South	Light (0-5 mph)	74	170	124	8.0	Routine
	10/19/20	8:32	High Tide Falling	Clear	Northeast	Light (0-5 mph)	71	17	31	5.6	Routine
	10/26/20	8:32	High Tide Falling	Cloudy	East-Southeast	Moderate (10-15 mph)	69	540	406	5.3	Routine

APPENDIX D

Summary of Louisiana BEACH Program's Fulfillment of U.S. EPA's BEACH Grant Requirements

Summary of Louisiana BEACH Program's Fulfillment of U.S. EPA's BEACH Grant Requirements

U.S. EPA established nine performance criteria that eligible coastal or Great Lakes state, tribal, or local governments must meet to receive grants to implement coastal recreation water monitoring and public notification programs under the BEACH Act. Those criteria, together with a brief summary how Louisiana has fulfilled each, are provided below.

Category	Performance Criterion	Louisiana's Fulfillment of Criterion
Evaluation and Classification	1. Develop risk-based beach evaluation and classification plan	Identification of factors used to evaluate and rank beaches are provided in Chapter 2 of the *Louisiana's BEACH Grant Final Report, Grant Year 2001* (the "Initial BEACH Report"; LDHH, 2003). More specifically: • Coastal recreation waters are identified in Section 2.1. • Beaches used by the public for water contact activities within coastal recreation waters are identified in Section 2.2. • The original information describing (1) the potential risk to human health presented by pathogens and (2) the use of the beaches is provided in Sections 2.3-2.4 of the Initial Report. Information on the prior year's water quality and projected level of use for each beach monitored under the Program are provided in Chapter 2 of the Program's annual report. • EPA is notified annually of any change in beach rankings and other program changes in Chapter 2 of the Program's annual report.
Monitoring	2. Develop tiered monitoring plan	• Chapter 3 of the Initial Beach Report describes the Program's monitoring plan, addressing the frequency and location of monitoring, and assessment criteria. • Chapter 2 of the Initial Beach Report describes periods of recreational use of the waters, and nature and extent of use during certain periods. • Sample stations were established based on spatial use patterns as described in Chapter 2 of the Initial Beach Report, adjusted for the proximity to known point and nonpoint sources of pollution. • Section 3.1 of the Initial Beach Report outlines the Program's quality control plan, which is described more completely in the Program's current Quality Assurance Project Plan (QAPP).
	3. Monitoring report submission and delegation	The Program reports monitoring data to the public, EPA, and other agencies through timely annual submission of those data to EPA's STORET database. Additionally, the full dataset and summaries are provided in the Program's Annual Report.

	4. Methods and assessment procedures	Methods for detecting levels of pathogen indicators in coastal recreation areas are described in Section 3.3 of the Initial Beach Report and the QAPP.
Public Notification and Prompt Risk Communication	5. Public notification and risk communication plan	Measures to notify the public, EPA and local governments when indicator bacteria levels exceed a water quality standard are provided in Chapter 4 of the Initial Beach Report.
	6. Measures to notify EPA and local governments	Measures to notify local governments and EPA when water quality standards are exceeded are provided in Chapter 4 of the Initial Beach Report. The Program submits notification data and actions taken to notify the public to EPA's PRAWN database annually.
	7. Measures to notify the public	Measures to notify the public when water quality standards are exceeded are provided in Chapter 4 of the Initial Beach Report. Upon observing an exceedance of water quality criteria, the Program immediately issues a public notification or resamples for bacterial exceedance of a water quality standard in accordance with the QAPP. The notification is placed on the Program's website, disseminated to the media, and signs posted at each station are changed to indicate that an advisory is in effect.
	8. Notification report submission and delegation	• EPA and local governments are notified annually of any notification plan changes and any delegation of responsibilities in the Program's annual work plan. • The Program reports actions taken to notify the public when water quality standards are exceeded in its annual PRAWN submission and in the Program's annual report.
Public Evaluation	9. Public evaluation of program	The Initial Beach Report and all subsequent annual reports have been made available to the public for review and comment. The Program publishes a public notice informing the public of the availability of the annual report and the duration of the comment period, and the report is made available on the Program's website.