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

Louisiana BEACH Grant Report
2008 Swimming Season

Submitted to U.S. Environmental Protection Agency
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in cooperation with Louisiana Department of Health and Hospitals
Office of Public Health, Center for Environmental Health

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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 beaches for which advisories were issued, the number of times water quality criteria were exceeded and the number of days under advisories for each beach. This report satisfies the reporting obligations set forth in the Beach Report and outlined above.

Due to the lingering impacts of Hurricane Rita, use of Cameron Parish beaches during the 2008 swimming season remained low relative to historic levels. Hurricane Ike further impacted Cameron Parish beaches in 2008, reducing use from mid-September through the balance of the 2008 swimming season, and eliminating access to Hackberry beach. Grand Isle State Park beaches were also closed for the majority of 2008 due to construction activities associated with beach restoration along the Park's shoreline to repair lingering damages from Hurricane Katrina. In early September 2008, Hurricane Gustav resulted in closure of the access road to Fourchon, which resulted in closure of the beach for the balance of the swimming season. Use at the remaining beaches during 2008 was at approximately historic levels (as estimated in 2003 and reported in the Beach Report).

Between 1 April 2008 and 31 October 2008, a total of 691 samples were collected at 27 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 eight Tier 1 or 2 continuous beach segments with a total of 39 advisories issued. All stations, except GISP3 and GISP4 which were closed due to construction activities associated with beach restoration from 15 May through the end of the season, had advisories issued during 2008 based on observed water quality exceedances. Compliance by station varied between 96% of monitored days in compliance at GIB 2 and GIB3, to a low of only 5% for the Hackberry station. In addition to advisories based on observed exceedances, 11 beach closures occurred in 2008: 6 stations (all Fourchon stations and GISP1 and GISP2) were closed for the balance of the season following Hurricane Gustav; 1 station (HACK1) was rendered inaccessible by Hurricane Ike; and 4 stations were closed due to construction activities associated with beach restoration at Grand Isle State Park. Across all sample stations, 1,460 of the 3,705 available

advisory days (39%) were in compliance and not under an advisory. An additional 930 station-days (19.5% of 4,758 station-days) were under a closure not associated with advisories based on observed exceedances.

As in past years, all advisories issued in 2008 resulted from exceedances of enterococci criteria, with exceedance of the geometric mean criterion involved in 96% of advisory-days. Forty-nine percent (49%) of the 295 observed advisory-weeks resulted from enterococci geometric mean exceedances only, and 139 (47.1%) advisory-weeks resulting from both enterococci geometric mean and single sample maximum exceedances. Only 11 (3.7%) of the 295 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, 49% of the observed exceedances during 2008 would not have been detected. Unlike previous years, 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 focused the examination of the relationships among indicator organism densities and environmental conditions on individual sample stations and data collected within the reporting year. In this report, as in 2006 and 2007, 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 2008, the improvements in water quality that were seen in 2007 at the CYPT and FNTB beach segments were reversed by unknown causes. Water quality at Grand Isle beach (GIB) also declined slightly in 2008 relative to previous years, but the decline is attributable in part to changes in water quality following Hurricane Gustav, and may have also been influenced by beach restoration activities at Grand Isle State Park to the east. At the three Cameron Parish beach segments (CNSTBC, HACK/RUTH, and HOLLY), the decline in water quality that was observed in 2007 continued in 2008 with no cause for the decline or source apparent.

Enterococci densities at the Cameron Parish beaches appear to be influenced by wind direction, wind speed, and weather, with higher enterococci densities expected as wind speed increases, when winds are from the south to southwest, and west-northwest, and under cloudy weather. The data also suggest that enterococci densities decrease with increasing salinity, although that relationship is weaker than the previously mentioned factors. Although no sources for the high enterococci densities have been identified, several hypotheses have been developed through discussion between LDHH and the Louisiana Department of Environmental Quality (LDEQ) staffs. Those hypotheses are that the source of the high enterococci density is: 1) local discharges at each beach; 2) a single major discharge affecting all beaches; 3) offshore sources; or 4) unique edaphic factors along the Cameron Parish coastline. A review of each of these hypotheses is discussed and the results of LDEQ's Calcasieu River study are presented in Chapter 3. The LDEQ Calcasieu River study results suggest that the high enterococci density at the Cameron Parish beaches is attributable to unique edaphic factors along the Cameron Parish coastline. Further study will be required to substantiate this hypothesis, but if edaphic factors are causing high enterococci densities to persist in beach sands then the next step will be determining the ramifications for public health.

Exploration of the environmental-indicator organism relationships at the remaining beaches found higher enterococci density is expected at FOUR when winds are from the west, under cloudy conditions, or high tide conditions. At the remaining beach segments (CYPT, FNTB, GIB, and GISP), no single variable accounted for 10% or more of the variability in enterococci densities.

Data quality assessment results indicate that precision goals were fully achieved for 2008 for fecal coliform and enterococci field duplicates, and all salinity QC samples. However, QC goals for fecal coliform and enterococci field splits were not met. The field split sampling precision goal for fecal coliform and enterococci are 30% RPD but the observed lab RPD exceeded that goal by an estimated 67% and 83%, respectively. In fact, the 2008 QC results for fecal coliform, enterococci, and salinity were not statistically different between field duplicates and field splits. This suggests that field samplers need to take greater care in the preparation of field split samples in the future, ensuring thorough mixing before splitting the sample into the two aliquots. If these results are not the result of sample handling, then the small difference in RPDs between field splits and field duplicates suggests that the majority of the observed variability is the result of the precision limits of the analysis method with only a small portion of the variability attributable to natural variability in the water column at a given location and time. If this proves to be the case, then the lab precision goals may need to be adjusted upward. All completeness goals were achieved. No inconsistencies with the QAPP were detected during 2008. All monitoring and notification data collected during 2008 have been uploaded to the appropriate EPA data storage systems.

Based on observed use levels and patterns near the end of the 2008 swimming season and projections of use for the 2009 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, FOUR4, and Grand Isle State Park. Cameron Parish beaches are expected to operate at 50%-75% of pre-hurricane levels, and Hackberry beach use is expected to remain limited during 2009 due to 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 associated with the FOUR4 sample station. Accordingly, FOUR4 will also be designated as a Tier 3 beach until full access is restored. At Grand Isle State Park, the beach restoration construction activities that resulted in the closure of the Park during 2008 are scheduled to continue during 2009. However, it is anticipated that the Park will open sometime in 2009 and return to historic level of use.

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 Hackberry and Rutherford Beaches, and the Constance Beach Complex), and one beach segment monitored as Tier 3 (FOUR4) in 2009. Based on those 2009 Tier assignments, 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 as Tier 3 beaches.

CHAPTER 1. Purpose, Background And 2008 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 2008 recreational period and satisfies all of the requirements described above.

This document consists of four chapters. In this chapter, 2008 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 2008 Program modifications, and changes to Tier assignments and beaches to be monitored under the Program in 2009. In Chapter 3, monitoring and response efforts and results for 2008 are provided. Data quality assessment results for the 2008 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 analysis 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 2008

In 2008, the Program continued to experience lingering impacts from hurricanes Katrina and Rita, with continuing diminished use at Cameron Parish Beaches and extended beach closures due to beach restoration activities at Grand Isle State Park. Additionally, the hurricane pattern of 2005 was similar in 2008, although less devastating. Hurricane Gustav made landfall near Cocodrie, Louisiana, as a category 2 hurricane on 1 September 2008, impacting beaches on the eastern half of the state. Hurricane Ike followed hurricane Gustav two weeks later, making landfall at Galveston Island, Texas, as a category 2 hurricane on 13 September 2008, impacting beaches on the western half of the state. In spite of these obstacles, during 2008 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; and 2) continued efforts to conduct more comprehensive analysis of the relationship between environmental factors and enterococci density, and 3) investigated the source of high enterococci densities at the Cameron Parish beaches. The Program continued to meet or exceed the majority of the quality assurance/quality control goals established in the program's QAPP. Given the quality of

data collected during 2008 along with the historic data collected during 2004–07, past efforts to accomplish a more comprehensive evaluation of the relationship between environmental factors and enterococci density continued and those results are presented in this report. Additionally, results of sampling completed by LDEQ to investigate the source of high enterococci densities at the Cameron Parish beaches are also presented in this report.

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 based 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 2008. Table 1 identifies the beaches that were monitored under the Program during 2008, their designated 2008 monitoring Tier, and associated sample stations. Due to the lingering impacts of Hurricane Rita, levels of use during the 2008 swimming season remained low relative to historic levels at Cameron Parish beaches. Hurricane Ike further impacted Cameron Parish beaches in 2008, reducing use from mid-September through the balance of the 2008 swimming season, and eliminating access to Hackberry. Grand Isle State Park beaches were also closed for the majority of 2008 due to construction activities associated with beach restoration along the Park's shoreline to repair lingering damages from Hurricane Katrina. In early September 2008, Hurricane Gustav resulted in closure of the access road to Fourchon, which resulted in closure of the beach for the balance of the swimming season. Use at the remaining beaches during 2008 was at approximately historic levels (as estimated in 2003 and reported in the Beach Report).

During 2008, five continuous beach segments were designated as Tier 1 beaches and scheduled for monitoring (Grand Isle, Cypremort Point, and Fontainebleau State Parks, and Fourchon and Holly Beaches), 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 2008 except during periods of hurricane or construction related closure as mentioned above. Pontchartrain Beach was monitored as a calibration site in 2008 to continue to gather data to reexamine the swim advisory on that portion of Lake Pontchartrain. Monitoring had not been initiated at the two beaches in Lake Charles.

Table 1. Continuous beach segments, beach miles, monitoring Tier assignments for 2008 and 2009, and sample stations.

Continuous Beach Segments	Designated Beach Miles	First Year Sampled	2008 Designated Monitoring Tier	2008 Actual Monitoring Tier	2009 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	NA	NA	1	LCNB1
South Beach & Rabbit Island	0.23	2009	NA	NA	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 2008, the Program monitored 6.0 Tier 1 beach miles at five of the seven continuous Tier 1 beach segments, including sampling and public notification at 15 of the 17 Tier 1 sample stations (Table 2). Three continuous beach segments totaling 14.9 miles were designated and monitored as Tier 2 beaches, including sampling and public notification at 10 sample stations. 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 2008 and planned for 2009.

	2008 (Actual)			2009 (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*	5	3	1	7	3	1
Number of Sample Stations Monitored	15	10	1	17	10	1
Total Beach Miles Monitored	6.0	14.9	1.6	6.7	14.9	1.6

For the 2009 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, FOUR4, and Grand Isle State Park (Table 3). Cameron Parish beaches are expected to operate at 50%-75% of pre-hurricane levels, and Hackberry beach use is expected to remain limited during 2009 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 associated with the FOUR4 sample station. Accordingly, FOUR4 will also be designated as a Tier 3 beach until full access is restored. At Grand Isle State Park, the beach restoration construction activities that resulted in the closure of the Park during 2008 are scheduled to continue during 2009. However, it is anticipated that the Park will open sometime in 2009.

Table 3. Beach water quality and use risk categories for 2008 swimming season based on anticipated use in 2008 and 2007 water quality data.

Continuous Beach Segments	Anticipated 2009 Use	2008 Entero. Geometric Mean	2008 Entero. Geometric Mean / 35	2008 Water Quality Risk Category	Entero. 95th Parametric Percentile All Data	WHO Risk Category
CNSTBC	Low	90.7	259%	Higher	617	D
CYPT	Mod.-High	80.2	229%	Higher	228	C
FNTB	High	22.0	63%	Moderate	170	B
FOUR	Very High	14.5	41%	Lower	88	B
GIB	Moderate	11.4	33%	Lower	38	A
GISP	Very High	15.9	45%	Lower	79	B
HACK-RUTH	Very Low	83.0	237%	Higher	470	C
HOLLY	Mod.-High	80.5	230%	Higher	450	C
PONT*	Very Low	10.3	30%	Lower	152	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.

Using 2008 water quality data, water quality risk categories were also calculated for each continuous beach segment for use in establishing 2009 Tier assignments (Table 3). Three continuous beach segments were classified in the lower water quality risk category (Grand Isle State Park, and Grand Isle Fourchon Beaches), one in the moderate risk category (Fontainebleau State Park) and four in the higher risk category (Constance Beach Complex, Cypremort Point State Park, Hackberry and Rutherford Beaches, and Holly Beach). Figure 1 shows the strong inverse linear relationship (R-Squared= 0.93, 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. Based on 2007 and 2008 data, the low risk category has an upper limit of approximately a 23% chance of an advisory, and the moderate risk category has an upper limit of approximately 40% of an advisory.

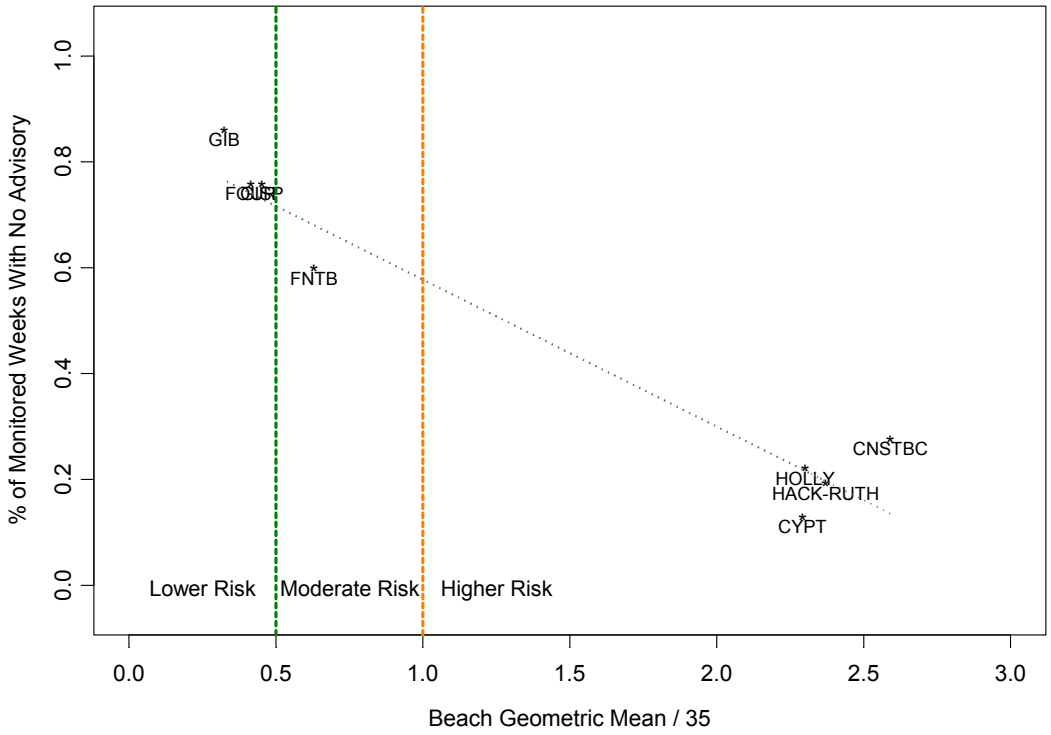


Figure 1. Water quality risk categories based on a continuous beach segment's enterococci geometric mean/35 and percent of monitored weeks without an advisory for 2008.

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 2008 water quality data and the results are provided in Table 3. The WHO uses the 95th percentile because it is easily understood to be the probability of encountering polluted water, reflecting 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 microbial water quality categories of categories A, B, C, and D are very good to good,-good to fair, fair to poor, and poor to very poor, respectively.

Applying the WHO classification, Louisiana has: one very good to good (WHO cat. A) continuous beach segment (Grand Isle Beach); three good to fair (WHO cat. B) beach segments (Fontainebleau and Grand Isle State Parks, and Fourchon Beach); three fair to poor (WHO cat. C) beach segments (Cypremort Point State Park, Hackberry and Rutherford Beaches, and Holly Beach); and one poor to very poor (WHO cat. D) beach segment (Constance Beach Complex). Pontchartrain Beach, which is not a Louisiana BEACH Program designated beach at this time, would be classified as good to fair (WHO cat. B) under the WHO system. 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 under the Louisiana system were ranked in WHO categories A and B (very good to good, and good to fair, respectively), Moderate equates to WHO category B, 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 Lower risk beach under the Louisiana system, and as a category B under the WHO system.

Combined 2008 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 2009. 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 2009, 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).

Program Modifications

No modifications were made to the Program's procedures, methods or decision rule during 2008. 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 line at http://www.ophbeachmonitoring.com/.

Table 4. Combined beach use and water quality risk categories for 2008.

# of Swimmers[2] ▲	Water Quality Risk[1] =►				
	Lower Risk	**Moderate Risk**	**Higher Risk**	**Unknown**	
VH	GISP, FOUR1-3			LCNB LCSB	**Tier 1**
H		FNTB	CYPT, HOLLY		
M	GIB				**Tier 2**
L			CNSTBC[4]		**Tier3**
VL	FOUR4, PONT[3]		HACK-RUTH[5]		
	Discretionary				

Notes: [1]Water quality risk level based on 2008 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 will be monitored as tier 2 beaches during 2009. [5]HACK-RUTH will be monitored as a tier 3 beach during 2009.

CHAPTER 3. Louisiana BEACH Program's 2008 Results

Number of Samples Collected

Between 7 April 2008 and 28 October 2008, a total of 691 samples were collected at 27 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 2008 by Louisiana's BEACH Program.

	Sample Type					
Sample Station	**Calibration**	**Field Duplicate**	**Field Split**	**Resample**	**Routine**	**Station Total**
CNST1	0	1	2	0	28	**31**
CYPT1	0	1	1	0	28	**30**
DUNG1	0	2	1	0	28	**31**
FNTB1	0	3	1	0	28	**32**
FOUR1	0	0	3	0	21	**24**
FOUR2	0	0	1	0	21	**22**
FOUR3	0	1	2	0	21	**24**
FOUR4	0	0	0	0	5	**5**
GBRZ1	0	2	2	0	28	**32**
GIB1	0	0	0	0	28	**28**
GIB2	0	1	2	0	28	**31**
GIB3	0	0	1	0	28	**29**
GISP1	0	0	0	0	13	**13**
GISP2	0	1	2	0	13	**16**
GISP3	0	1	0	0	6	**7**
GISP4	0	1	0	0	6	**7**
HACK1	0	2	2	0	22	**26**
HOLLY1	0	1	3	0	27	**31**
HOLLY2	0	3	1	0	27	**31**
HOLLY3	0	0	2	0	28	**30**
HOLLY4	0	1	3	0	28	**32**
HOLLY5	0	1	1	0	28	**30**
HOLLY6	0	1	2	0	28	**31**
LTFL1	0	1	0	0	28	**29**
MART1	0	2	2	0	28	**32**
PONT1	27	1	0	0	0	**28**
RUTH1	0	2	2	0	25	**29**
Sample Type Total	**27**	**29**	**36**	**0**	**599**	**691**

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 599 routine samples were collected across the 26 sample locations monitored in 2008. 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 27 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.

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 ($\sim$ 5% each) of field duplicate and field split samples. QC samples were 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 29 field duplicates and 36 field split samples were collected during 2008. A total of 67 QC samples were scheduled to be collected concurrent with the 599 routine samples and 27 calibration samples that were collected, and were to consist of 30 field duplicates and 37 field split samples. Twenty-eight (28) field duplicates were sampled as scheduled (93%), and 35 field split samples were collected as scheduled (95%), resulting in 94% of scheduled QC samples collected. One unscheduled field duplicate and unscheduled one field split samples were collected, resulting in a total of 29 field duplicate and 36 field split quality control samples collected, or 97% of the QC sample goal achieved. 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. Unlike past years, there were no resamples collected during 2008.

Of the 691 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 626 independent samples collected during the 2008 designated monitoring season (see Table 6).

Summary Statistics For 2008 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 2008 designated monitoring period are summarized in Table 7, and those summaries are depicted graphically in Figures 2 through 5. 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 their small sample size, and for GISP samples were not distributed throughout the year and thus cannot be considered representative of the swimming season.

Table 6. Number of independent samples collected by sample station during the 2008 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	28
CYPT1	28
DUNG1	28
FNTB1	28
FOUR1	21
FOUR2	21
FOUR3	21
FOUR4	5
GBRZ1	28
GIB1	28
GIB2	28
GIB3	28
GISP1	13
GISP2	13
GISP3	6
GISP4	6
HACK1	22
HOLLY1	27
HOLLY2	27
HOLLY3	28
HOLLY4	28
HOLLY5	28
HOLLY6	28
LTFL1	28
MART1	28
PONT1	27
RUTH1	25
Totals	**626**

Table 7. Summary statistics for fecal coliform and enterococci density (MPN/100ml), and salinity for samples collected during the 2008 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	4.24	1.45	1.15	93.73	4.54	1.44	22.25	7.94	28
CYPT1	15.06	2.71	1.25	80.22	4.38	1.41	2.84	3.07	28
DUNG1	4.11	1.41	0.84	94.55	4.55	1.51	22.74	8.14	28
FNTB1	27.16	3.30	1.46	22.02	3.09	1.43	3.73	2.76	28
FOUR1	10.58	2.36	1.58	20.74	3.03	1.75	23.25	9.13	21
FOUR2	11.80	2.47	1.31	13.46	2.60	1.37	23.81	8.63	21
FOUR3	7.17	1.97	1.56	13.19	2.58	1.41	23.92	8.52	21
FOUR4	3.83	1.34	1.06	6.60	1.89	0.38	24.55	8.53	5
GBRZ1	4.57	1.52	0.92	106.97	4.67	1.50	22.57	7.90	28
GIB1	8.91	2.19	1.25	11.61	2.45	1.27	20.83	7.41	28
GIB2	5.44	1.69	1.34	10.94	2.39	1.15	21.20	7.61	28
GIB3	4.71	1.55	1.02	11.55	2.45	0.89	21.71	7.62	28
GISP1	52.39	3.96	1.05	25.91	3.25	1.04	20.35	8.26	13
GISP2	42.76	3.76	1.25	15.54	2.74	1.23	20.34	8.31	13
GISP3	73.45	4.30	1.41	8.49	2.14	0.52	13.02	3.04	6
GISP4	90.15	4.50	2.40	10.64	2.36	1.20	13.23	3.25	6
HACK1	6.52	1.87	1.17	87.96	4.48	1.35	18.62	8.73	22
HOLLY1	6.28	1.84	1.21	69.31	4.24	1.32	20.44	8.08	27
HOLLY2	8.68	2.16	1.26	67.28	4.21	1.36	21.13	8.30	27
HOLLY3	8.06	2.09	1.29	74.84	4.32	1.37	21.50	8.04	28
HOLLY4	9.72	2.27	1.38	87.17	4.47	1.47	21.86	8.10	28
HOLLY5	11.14	2.41	1.39	98.34	4.59	1.28	21.54	8.07	28
HOLLY6	6.74	1.91	1.30	90.18	4.50	1.55	21.58	8.15	28
LTFL1	3.99	1.38	0.91	86.96	4.47	1.51	22.32	7.88	28
MART1	3.59	1.28	1.09	74.33	4.31	1.73	22.73	7.80	28
PONT1	14.68	2.69	1.31	10.34	2.34	0.95	4.55	2.28	27
RUTH1	6.03	1.80	1.15	78.78	4.37	1.35	20.10	8.89	25

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

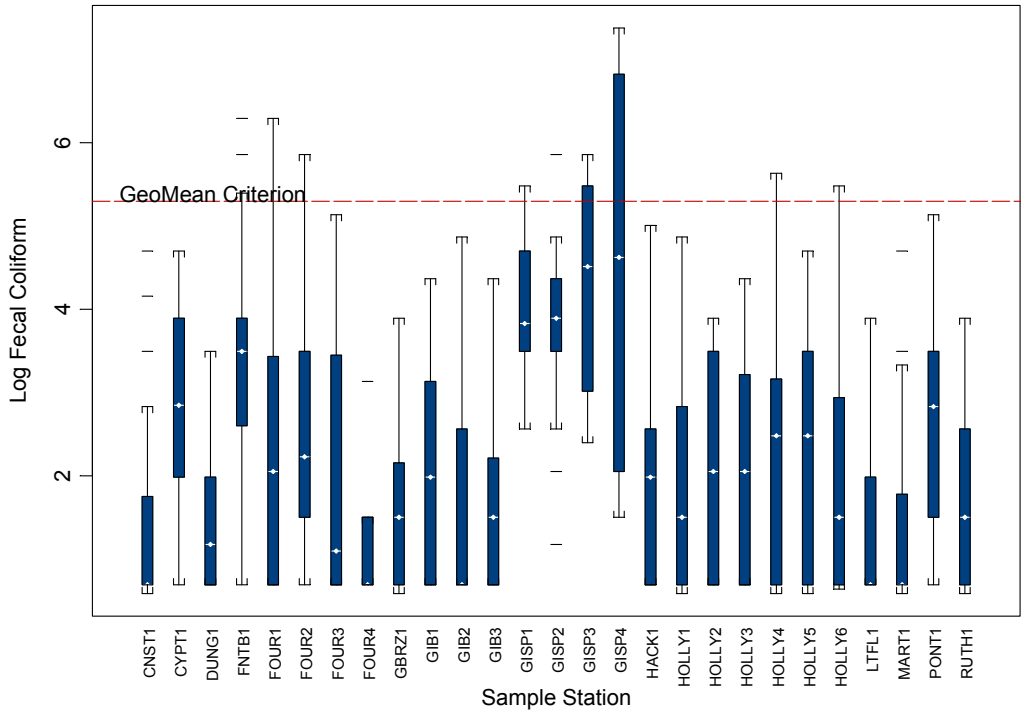


Figure 2. The distribution of $\log_e$ transformed fecal coliform densities (MPN/100ml) by sample station and relative to the geometric mean criterion for samples collected during the 2008 designated monitoring season. The box represents the inner quartile range (25th to 75th percentiles), and upper 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 2 and 3 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 2008 designated monitoring season. Figure 4 shows the relationship between fecal coliform and enterococci geometric mean densities by sample station for samples collected during the 2008 designated monitoring season. Grand Isle State Park stations were excluded from Figure 4 because only a small, unrepresentative sample set was collected at those stations in 2008. 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 the fecal coliform and enterococci densities of each sample 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 5.

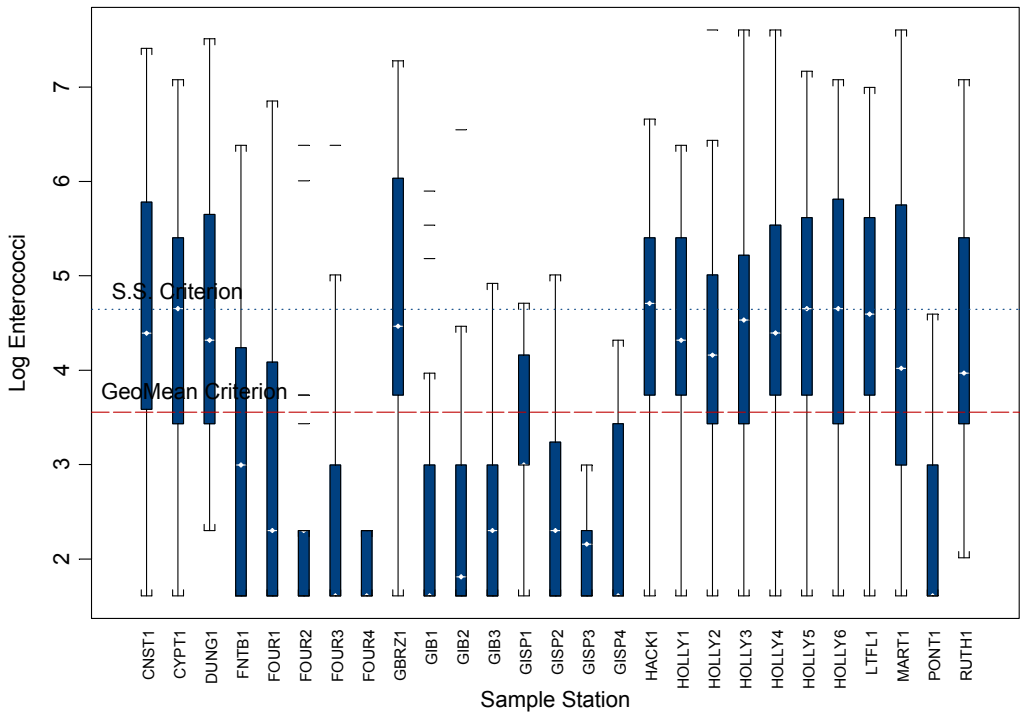


Figure 3. The distribution of $\log_e$ transformed enterococci densities (MPN/100ml) by sample station and relative to geometric mean and single sample maximum criteria for samples collected during the 2008 designated monitoring season.

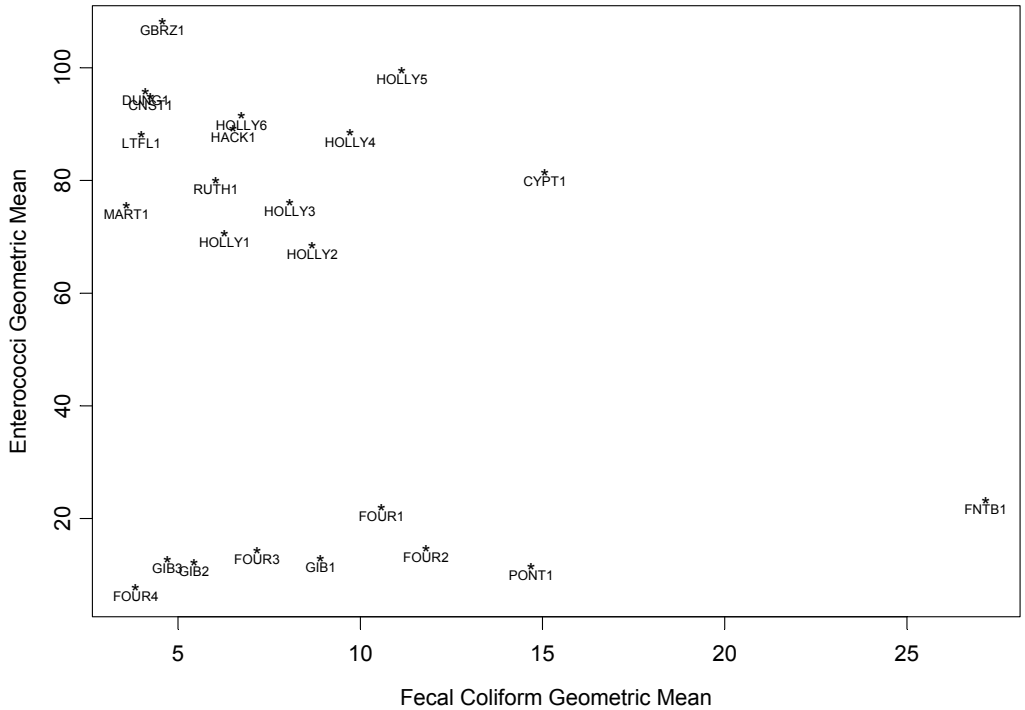


Figure 4. Fecal coliform and enterococci geometric mean densities (MPN/100ml) by sample station for samples collected during the 2008 designated monitoring season.

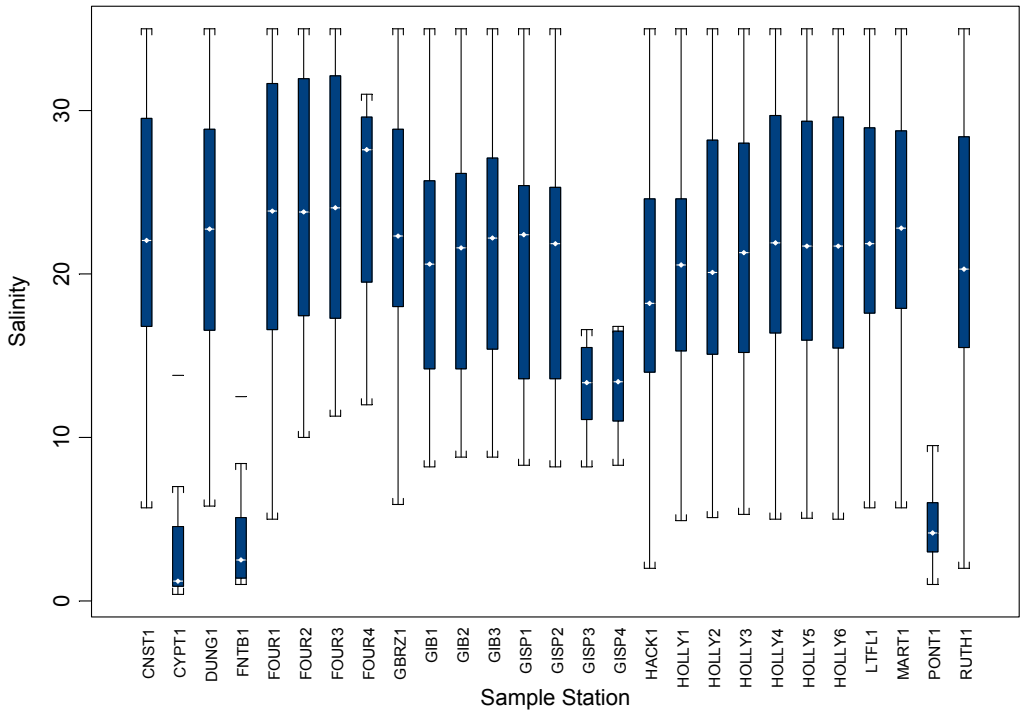


Figure 5. The distribution of salinity (ppt) by sample station for samples collected during the 2008 designated monitoring season.

Time-Series of 2008 Designated Monitoring Period Samples

In addition to calculating summary statistics for each sample station over the 2008 designated monitoring period, results are presented as a time-series (Appendix B, Figures B.1 through B.27; data for each sample event is provided in Appendix C). Because sample results were used to make weekly determinations of whether or not water quality at each sample station met the Program's water quality criteria during the designated monitoring season 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 is exceeded, the sample station is classified as not in compliance and a swimming advisory is issued. The advisory remains in effect until the most recent sample results and the running geometric means are all less than or equal to their respective criterion.

Weekly Decision Rule Outcomes

During the 2008 swimming season (1 May – 31 October), 26 sample stations were monitored at eight Tier 1 or 2 continuous beach segments with a total of 39 advisories issued. All stations, except GISP3 and GISP4, which were closed from 15 May through the end of the season due to

beach restoration related construction activities, had advisories issued during 2008 based on observed water quality exceedances (see Tables 8 and 9). Compliance by station varied between 96% of monitored days in compliance at GIB 2 and GIB3, to a low of only 6% for the Hackberry station. In addition to advisories based on observed exceedances, 11 beach closures occurred in 2008: 6 stations (all Fourchon stations and GISP1 and GISP2) were closed for the balance of the season following Hurricane Gustav; 1 station (HACK1) was rendered inaccessible by Hurricane Ike; and 4 stations were closed due to construction activities associated with beach restoration at Grand Isle State Park. Across all sample stations, 1,609 of the 3,854 available advisory days (42%) were in compliance and not under an advisory. An additional 930 station-days (19% of 4,784 station-days) were under a closure not associated with advisories based on observed exceedances.

All advisories issued in 2008 resulted from exceedances of enterococci criteria (Table 10). More specifically, the geometric mean criterion was exceeded in 284 of 295 observed noncompliance weeks (96.2%), with 145 (49.2%) of those noncompliance weeks resulting from enterococci geometric mean exceedances only, and 139 (47.1%) resulting from both enterococci geometric mean and single sample maximum exceedances. Only 11 (3.7%) of the 295 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 49.2% of the observed noncompliance weeks. The fecal coliform geometric mean criterion was not exceeded for any station-week during the 2008 monitoring season and thus was not involved in any advisories.

In response to determining that water quality criteria had been exceeded, an advisory was issued. To notify the public that a swimming advisories 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) and the Earth 911 website (http://www.earth911.org/WaterQuality/).

Table 8. Advisory history by beach and week for beach segments designated and monitored as either Tier 1 or Tier 2 beaches during the 2008 swimming season.

	Friday of Week – 2008 Swimming Season																									
Station ID	5/8	5/15	5/22	5/29	6/6	6/13	6/19	6/25	7/2	7/9	7/17	7/24	7/31	8/7	8/13	8/21	8/28	9/4	9/11	9/18	9/24	10/2	10/10	10/16	10/23	10/30
CNST1	A	A	A	A	A	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
DUNG1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			A					
FNTB1										A	A	A	A	A	A	A	A	A		A			A			
FOUR1											A	A	A	A	A	A	A	C	C	C	C	C	C	C	C	C
FOUR2													A		A	A	A	C	C	C	C	C	C	C	C	C
FOUR3												A			A	A		C	C	C	C	C	C	C	C	C
GBRZ1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A					
GIB1												A	A	A	A	A	A	A	A	A	A					
GIB2																			A							
GIB3					A																					
GISP1			C	C	C	C	C	C	C	C	C	C	C	C	A	A	A	C	C	C	C	C	C	C	C	C
GISP2			C	C	C	C	C	C	C	C	C	C	C	C	A			C	C	C	C	C	C	C	C	C
GISP3			C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
GISP4			C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
HACK1	A	A	A	A	A	A	A	A	A	A	A	A	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		
HOLLY4	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					
LTFL1	A	A	A	A	A	A	A	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	A	A					
RUTH1	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 either construction activities or hurricanes.

Table 9. Summary of 2008 advisories and closures.

State ID	Days Under Closure	% of Station-Days Under Closure	Available Advisory Days	Days Under Advisory	% of Season Under Advisory	% of Season In Compliance
CNST1		0.0%	184	133	72.3%	27.7%
CYPT1		0.0%	184	162	88.0%	12.0%
DUNG1		0.0%	184	134	72.8%	27.2%
FNTB1		0.0%	184	76	41.3%	58.7%
FOUR1	60	32.8%	124	46	37.1%	62.9%
FOUR2	60	32.8%	124	26	21.0%	79.0%
FOUR3	60	32.8%	124	22	17.7%	82.3%
FOUR4	60	32.8%	124	NA	NA	NA
GBRZ1		0.0%	184	147	79.9%	20.1%
GIB1		0.0%	184	70	38.0%	62.0%
GIB2		0.0%	184	7	3.8%	96.2%
GIB3		0.0%	184	7	3.8%	96.2%
GISP1	152	83.1%	32	17	53.1%	46.9%
GISP2	152	83.1%	32	6	18.8%	81.3%
GISP3	169	92.3%	15	0	0.0%	100.0%
GISP4	169	92.3%	15	0	0.0%	100.0%
HACK1	48	26.2%	136	128	94.1%	5.9%
HOLLY1		0.0%	184	147	79.9%	20.1%
HOLLY2		0.0%	184	147	79.9%	20.1%
HOLLY3		0.0%	184	141	76.6%	23.4%
HOLLY4		0.0%	184	141	76.6%	23.4%
HOLLY5		0.0%	184	161	87.5%	12.5%
HOLLY6		0.0%	184	134	72.8%	27.2%
LTFL1		0.0%	184	141	76.6%	23.4%
MART1		0.0%	184	119	64.7%	35.3%
RUTH1		0.0%	184	133	72.3%	27.7%

Table 10. Summary of weekly decision rule exceedances by cause for 2008.

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	145	49.2%
Only Enterococci single sample max criteria exceeded	11	3.7%
Both Enterococci geometric mean and single sample max criteria exceeded	139	47.1%
All criteria exceeded	0	0%
Total	**295**	**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*. That analysis determined 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.

Evaluations of environmental factors in the first two Louisiana BEACH Program annual reports (2004 and 2005) focused the examination of the relationships among indicator organism densities and environmental conditions on individual sample stations and data collected within the reporting year. In this report, as in 2006 and 2007, 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 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 (note

that the number of samples collected at Grand Isle State Park (GISP) in 2008 was extremely low due to beach restoration activities that closed the beach segment for most of the year).

Knowledge of environmental factor influence on indicator organism densities is required to develop predictive models, which EPA has encouraged BEACH Program participants to do because of the poor temporal autocorrelation of indicator organism densities in natural waters and 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 upon which precautionary advisories could be issued. Discussed below are Louisiana's efforts to investigate how the density of indicator organisms is influenced by environmental factors through development of predictive models. 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. Two such area groups were identified: the Grand Isle area group consisting of Grand Isle State Park, Grand Isle Beach, and Fourchon segments, and Cameron Parish area group consisting of Hackberry-Rutherford and Holly beaches, and Constance Beach complex.

Because all advisories issued from program inception in 2004 through 2008 were issued in response to exceedance of enterococci criteria, with 96% of 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**	**Segment Totals**
CNSTBC (5)	0	128	80	181	140	529
CYPT (1)	33	23	33	30	28	147
FNTB (1)	39	22	15	30	28	134
FOUR (4)	0	93	0	123	68	284
GIB (3)	0	66	91	92	84	333
GISP (4)	135	91	128	122	38	514
HACK-RUTH (2)	0	53	32	67	47	199
HOLLY (6)	0	153	96	211	166	626
PONT (1)	28	0	0	28	27	83
Year Totals	235	629	475	884	626	2849

The first step in the examination of 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, 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. A new variable to examine wind direction relative to the shore was also created, WindOnShore, with onshore winds = +1, and offshore = -1; the variable equals the cosine of the wind azimuth relative to shore. 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 are plotted for each continuous beach segment as Figures 6-13, and are 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 6-13.

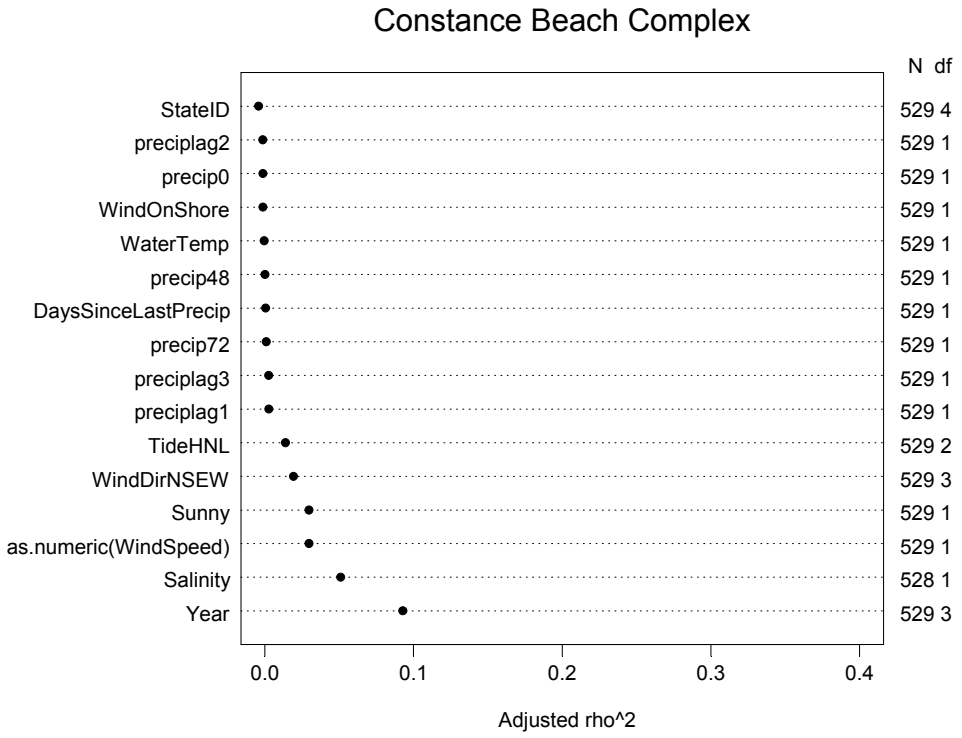


Figure 6. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2008 data from all Constance Beach Complex sample stations.

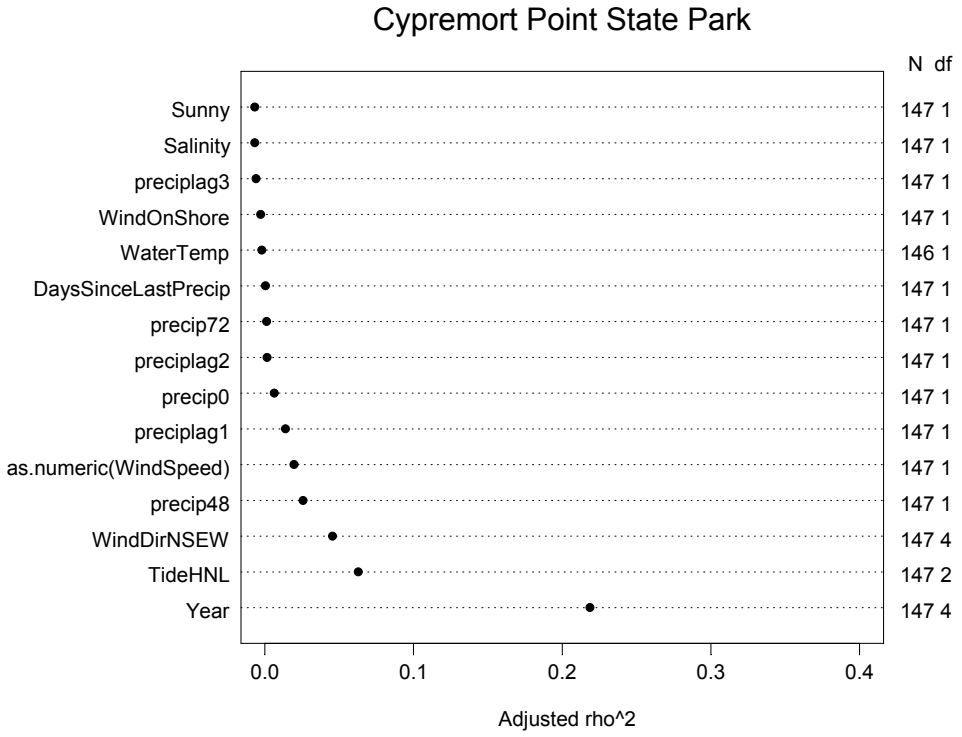


Figure 7. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2004-2008 data from the Cypremort Point State Park sample station.

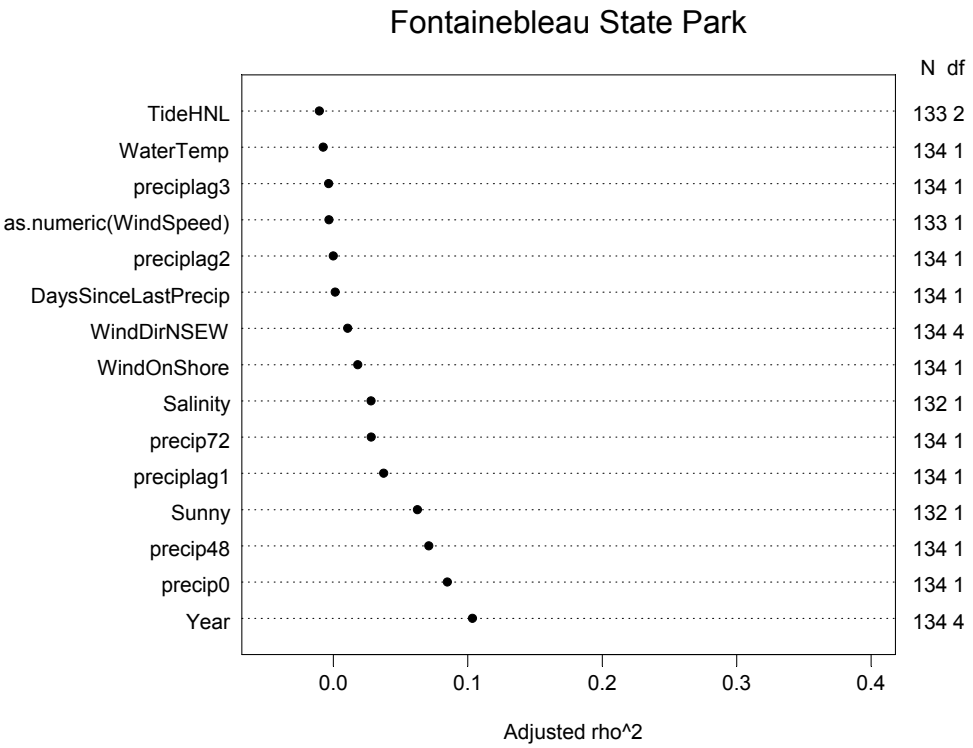


Figure 8. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2004-2008 data from the Fontainebleau State Park sample station.

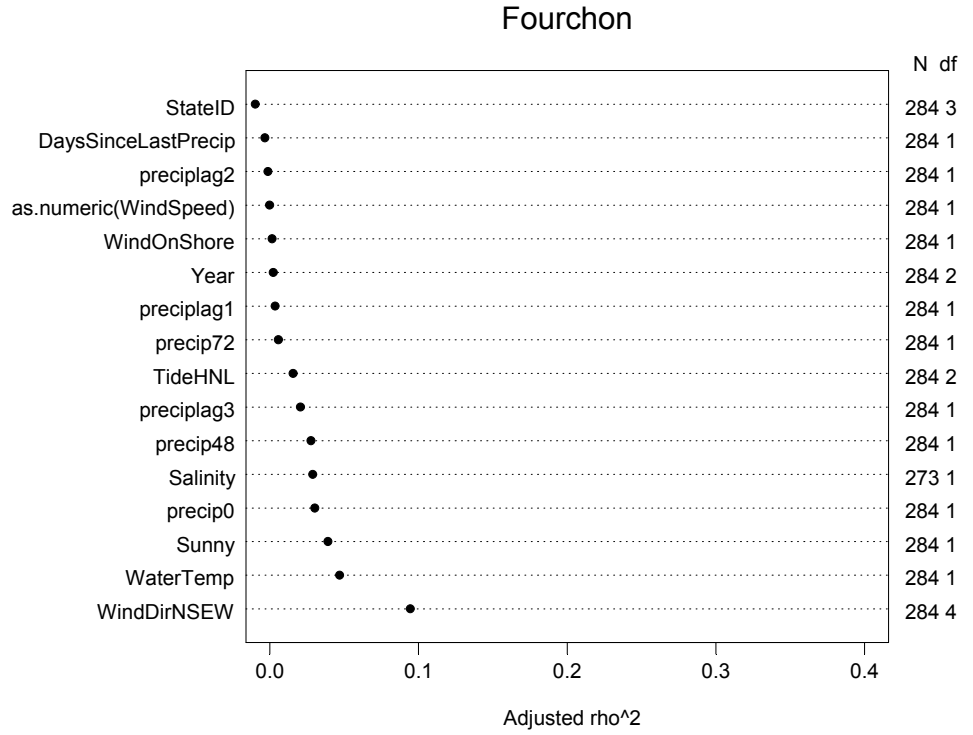


Figure 9. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005, 2007 and 2008 data from all Fourchon Beach sample stations.

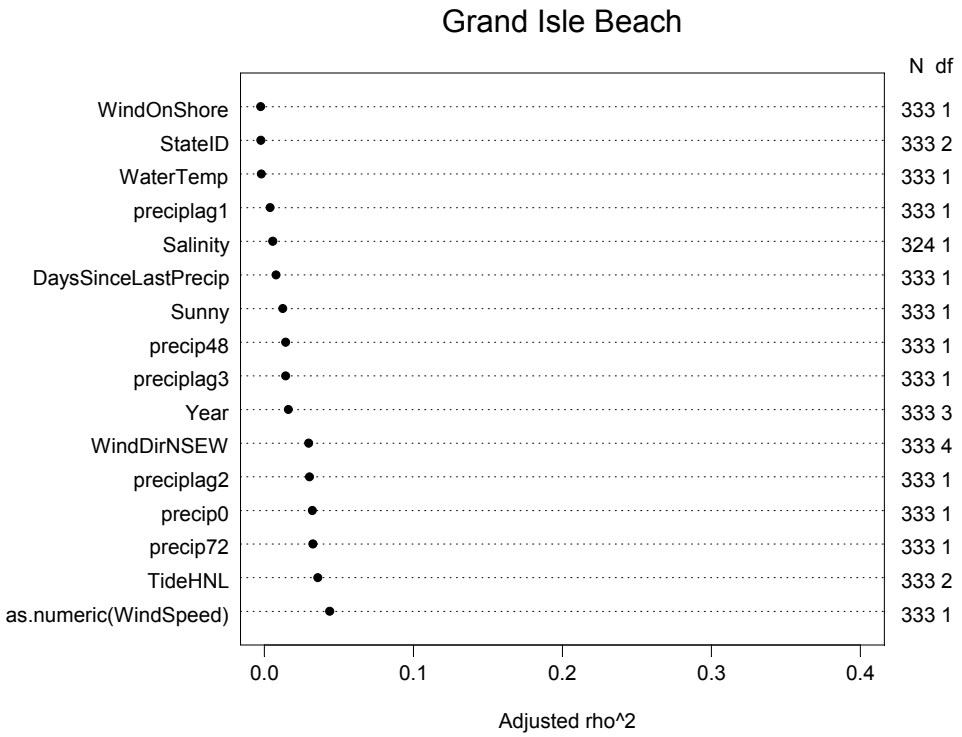


Figure 10. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2008 data from all Grand Isle Beach sample stations.

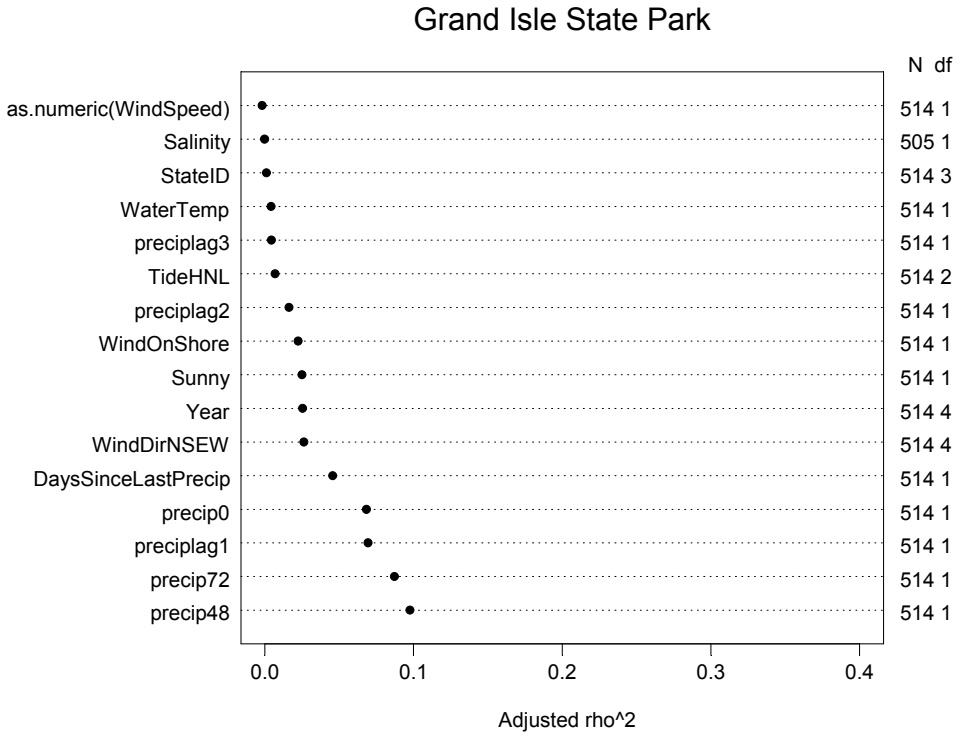


Figure 11. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2004-2008 data from all Grand Isle State Park sample stations.

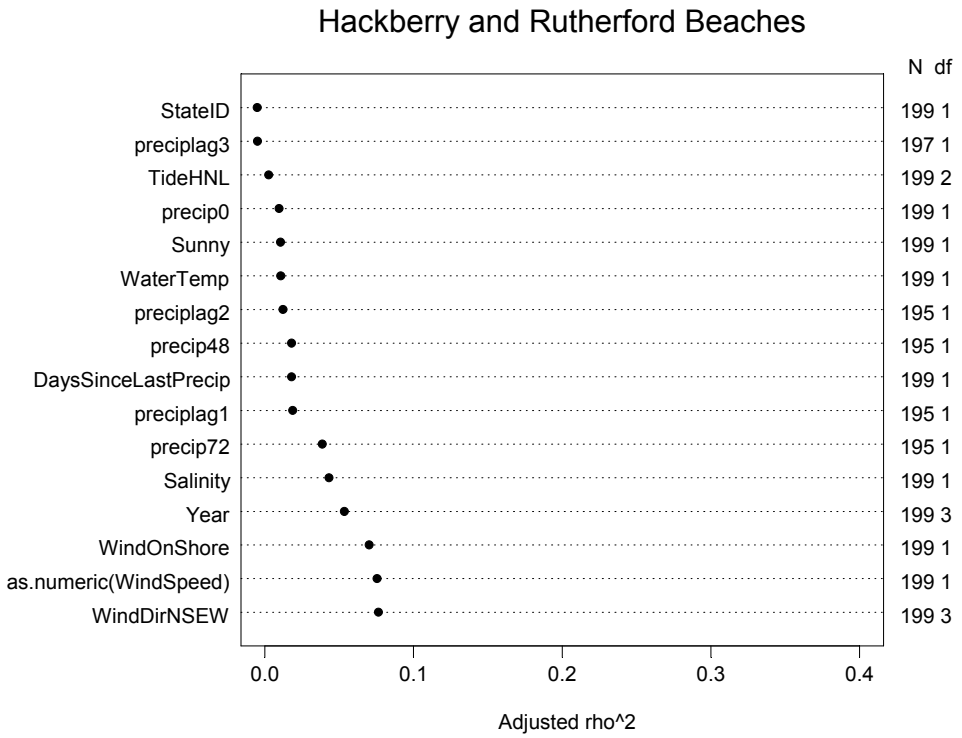


Figure 12. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2008 data from Hackberry and Rutherford Beach sample stations.

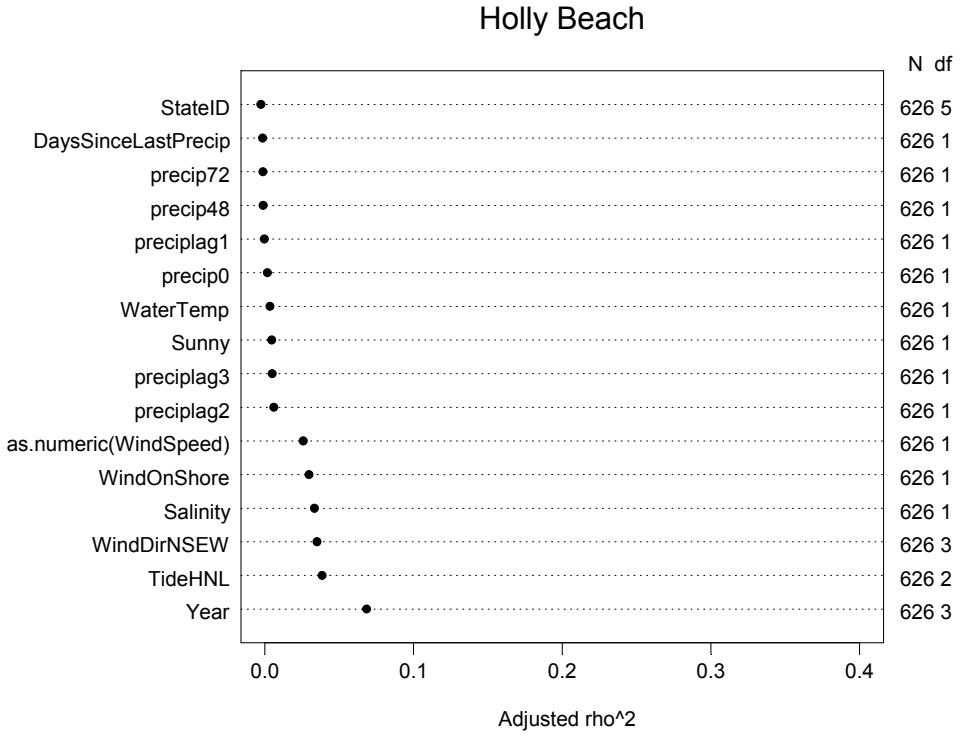


Figure 13. Influence of environmental factors on enterococci densities based on Spearman's adjusted rho^2 using 2005-2008 data from all Holly Beach sample stations.

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), and that enterococci densities have changed from year to year (Year) at all beach segments except FOUR, which has remained stable (Figure 14). During 2008, the improvements in water quality that were seen in 2007 at the CYPT and FNTB beach segments were reversed. The cause of the decline at those segments is unknown. Water quality at Grand Isle beach (GIB) also declined slightly in 2008 relative to previous years, but the decline is attributable in part to changes in water quality following Hurricane Gustav, and may have also been influenced by beach restoration activities at Grand Isle State Park to the east. At the three Cameron Parish beach segments (CNSTBC, HACK/RUTH, and HOLLY), the decline in water quality that was observed in 2007 continued in 2008 with no apparent cause or source for the high enterococci densities.

Table 12. Summary of the influence of environmental factors on enterococci densities by continuous beach segment based on Spearman's adjusted rho^2 using 2004–2008 data.

				Environmental Variable												
Continuous Beach Segment	# of Beach Stations	StateID	Year	TideHNL	Sunny	Wind Dir. NSEW	WindOnShore	numeric Wind Speed	Water Temp.	Salinity	precip0	preciplag1	preciplag2	preciplag3	precip48	precip72	DaysSinceLastRain
FNTB	1	NA	**		*					-	*	-			*	-	
CYPT	1	NA	**	*		-		-							-		
GISP	4		-		-	-	-				*	*	-		*	*	-
GIB	3		-	-	-	-		-			-		-	-	-	-	
FOUR	4			-	-	*			-	-	-			-	-		
Grand Isle Area Group	11	-	-			-			-		-	-	-	-	-	-	-
HACK/RUTH	2		*			*	*	*		-		-			-	-	-
HOLLY	6		*	-	-	-	-	-		-			-	-			
CNSTBC	5		*	-	-	-		-		*							
Cameron Parish Group	13		*	-	-	-	-	-		-		-	-	-		-	-

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.

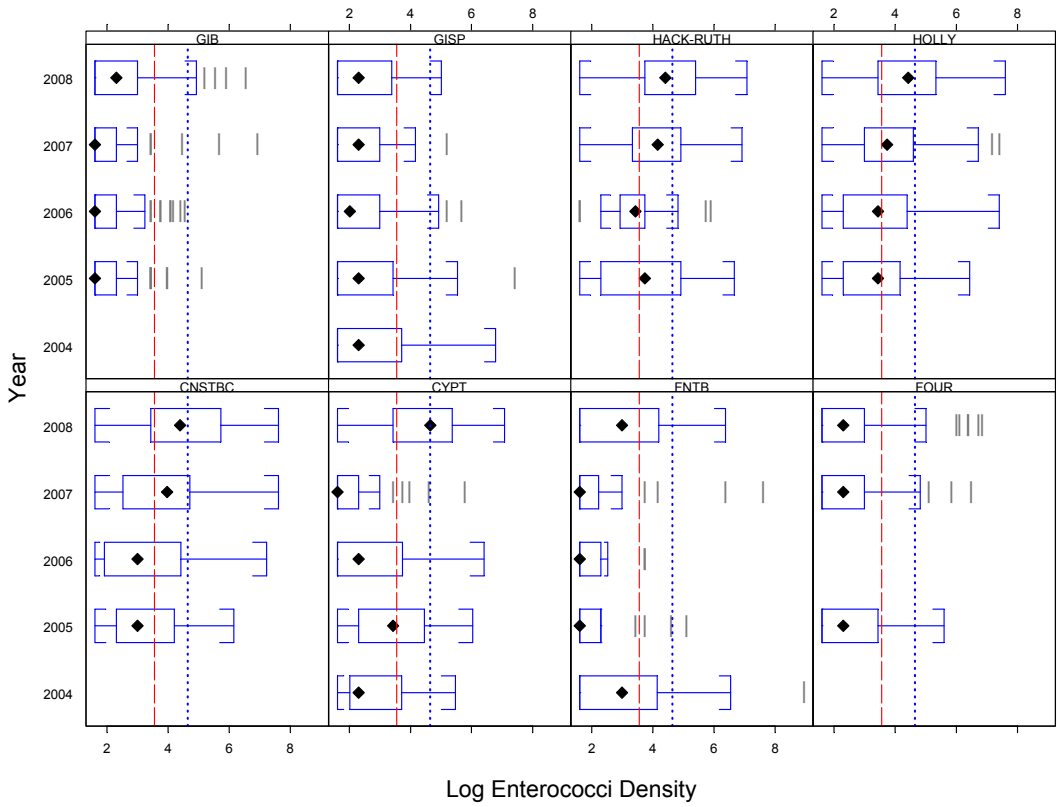


Figure 14. Distribution of $\log_e$ enterococci densities by year within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

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 explain more than a small fraction (<10%) of the variability in enterococci density (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 models were developed for FNTB: $\log_e$ enterococci ~ Sunny + Salinity + precip0, and $\log_e$ enterococci ~ Sunny + Salinity + precip48. The competing model that best fit the data was chosen using AIC (Burnham and Anderson 1998; Venables and Ripley 2002). Stepwise selection was then applied to the best full competing model to eliminate unnecessary variables, with variable selection again based on AIC to identify the most parsimonious model that best fit the observed data. The variables that remained in the final models for each continuous beach segment and beach area group are provided in Table 13, with model ANOVA and coefficients presented in Appendix E.

The R^2 values presented in Table 13 shows that the best model for each continuous beach segment and area group explain only a small fraction of the total variability in indicator organism density. Thus, these 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. To examine the influence of each of

the variables in the models, enterococci density estimates are first provided for each continuous beach segment and area group under a set of base environmental conditions (the "base model"). Next, in turn, the value of each environmental variable in the model was adjusted while holding all other base model conditions constant. Enterococci density estimates under those alternative conditions provide insight into the relative influence of changes in each variable. The relationship between $\log_e$ enterococci density and each model variable is provided in Figures 15-21 to aid in model interpretation. Note that only precip48 is presented graphically although other precipitation variables were modeled. Precip48 was selected for plotting because it was a competing variable with the other precipitation variables and graphs of precip48 are comparable to the other precipitation variables, differing primarily in scale.

Table 13. Summary of the environmental variables and R^2 values for the final models for each continuous beach segment and area group. "*" indicates that the environmental variable was in the final model.

Continuous Beach Segment	# of Beach Stations	Environmental Variable											Best Model R2
		TideHNL	Sunny	Wind Dir. NSEW	numeric Wind Speed	Wind Dir. NSEW * numeric Wind Speed	Water Temp.	Salinity	precip0	preciplag1	precip48	precip72	
FNTB	1		*								*		0.16
CYPT	1	*		*	*						*		0.17
GISP	4		*	*								*	0.12
GIB	3	*		*	*				*				0.13
FOUR	4	*	*	*				*			*		0.25
Grand Isle Area Group	11			*			*					*	0.08
HACK-RUTH	2			*	*			*					0.23
HOLLY	6	*		*	*	*		*					0.16
CNSTBC	5		*	*	*			*					0.14
Cameron Parish Group	13	*	*	*	*	*		*		*			0.15

Model results for FNTB indicate that the environmental variables Sunny and precip48 were most influential. The model predicts an enterococci density of 15 (approx. 95% C.I. = 10-21) under cloudy conditions with no rain within 48 hours prior to sample collection (the base model). The estimated enterococci density at FNTB is reduced to 9 (6-13) under sunny conditions, and increased to 19 (14-26) with 0.45 inches (the 75th percentile of 2004–08 observed rainfall) of precipitation within 48 hours prior to sample collection.

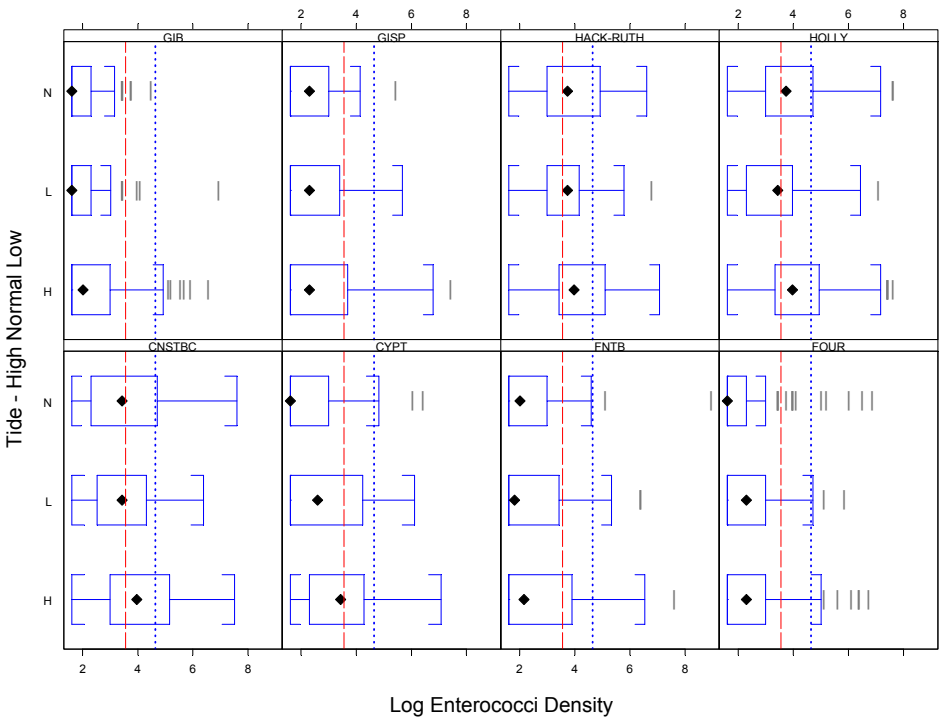


Figure 15. Distribution of $\log_e$ enterococci densities by tide (H=high, L=low, and N=normal) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

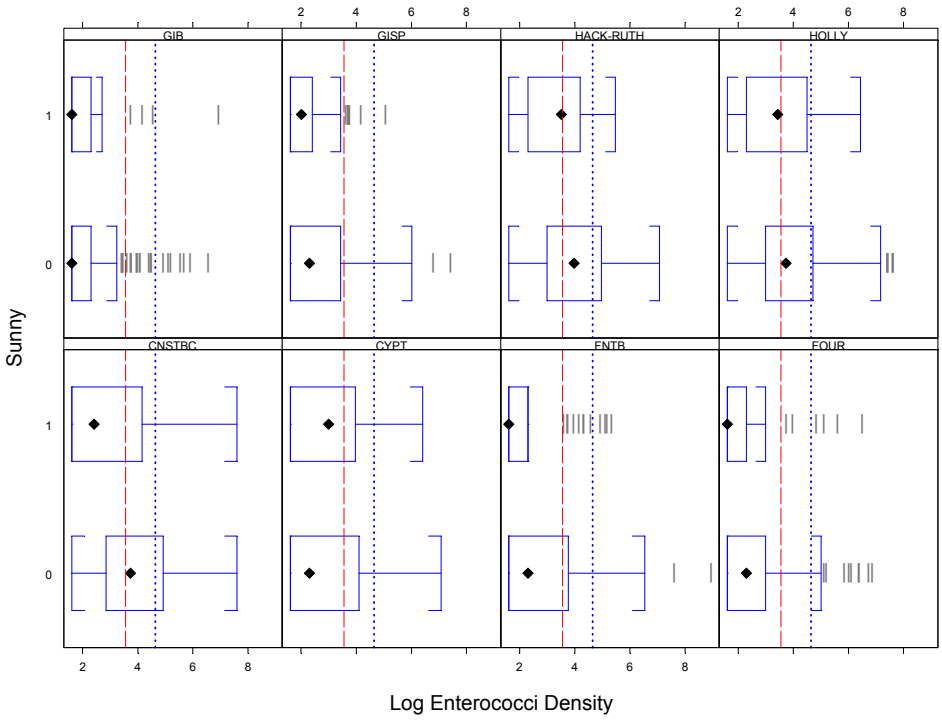


Figure 16. Distribution of $\log_e$ enterococci densities by cloudy (Sunny=0) and sunny (Sunny=1) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

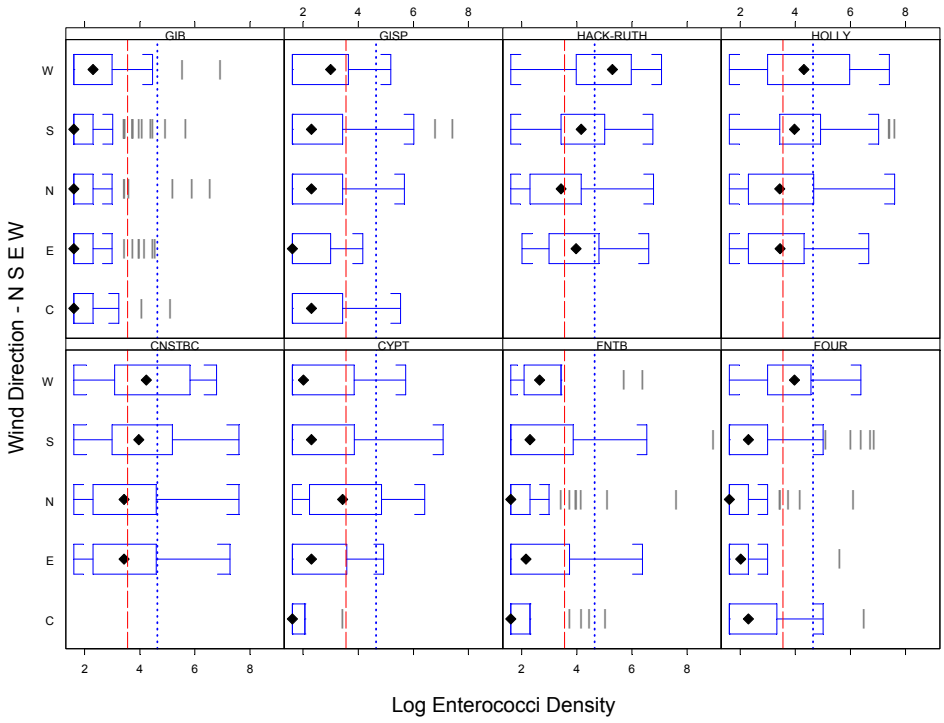


Figure 17. Distribution of $\log_e$ enterococci densities by wind direction (C=calm, E=east, N=north, S=south, W=west) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

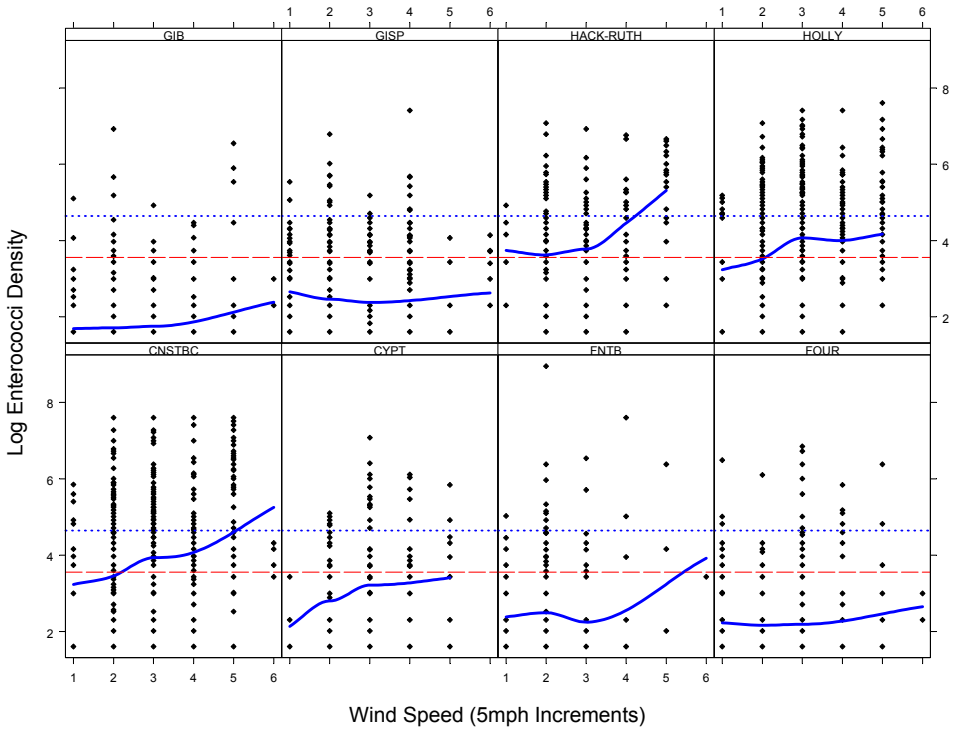


Figure 18. Relationship between $\log_e$ enterococci densities and wind speed shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines). Wind speed 1 = calm winds, 2 = 0-5mph, and 3-6 increase in increments of 5mph from category 2.

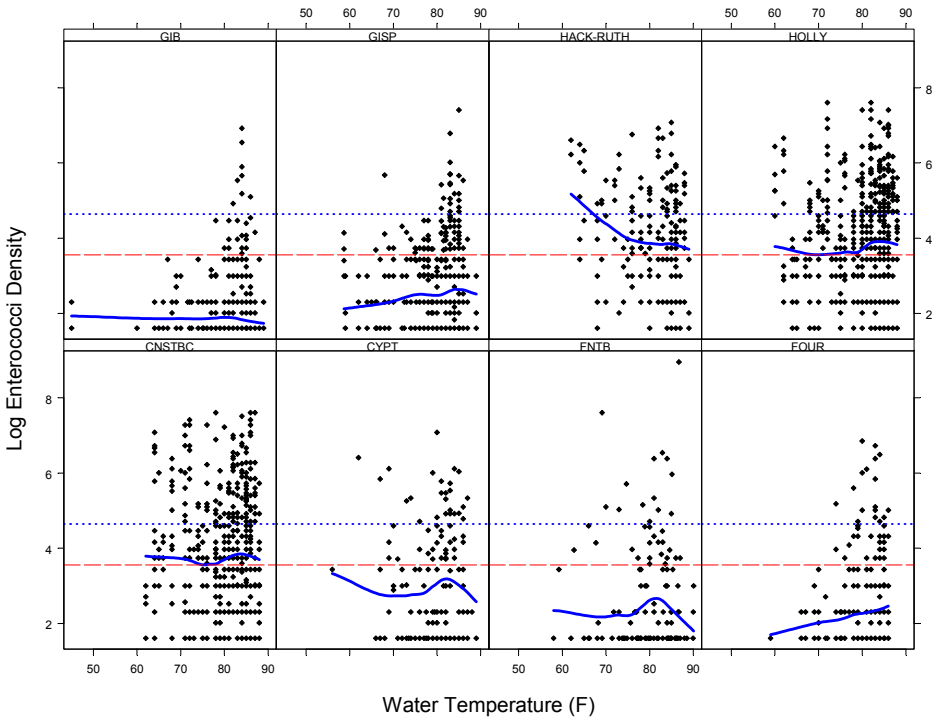


Figure 19. Relationship between $\log_e$ enterococci densities and surface water temperature shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

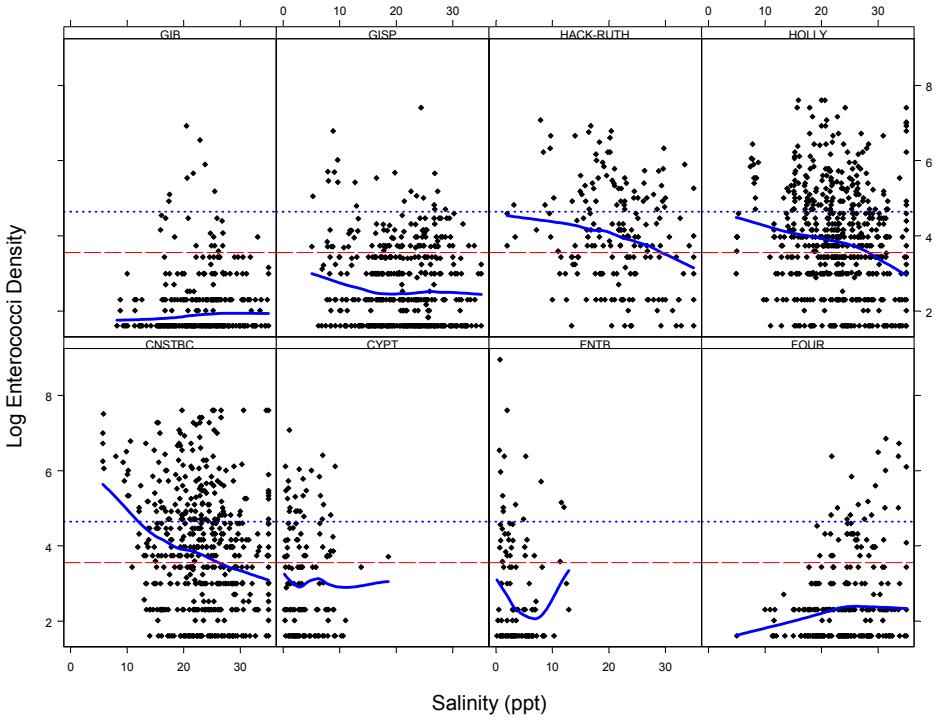


Figure 20. Relationship between $\log_e$ enterococci densities and salinity shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

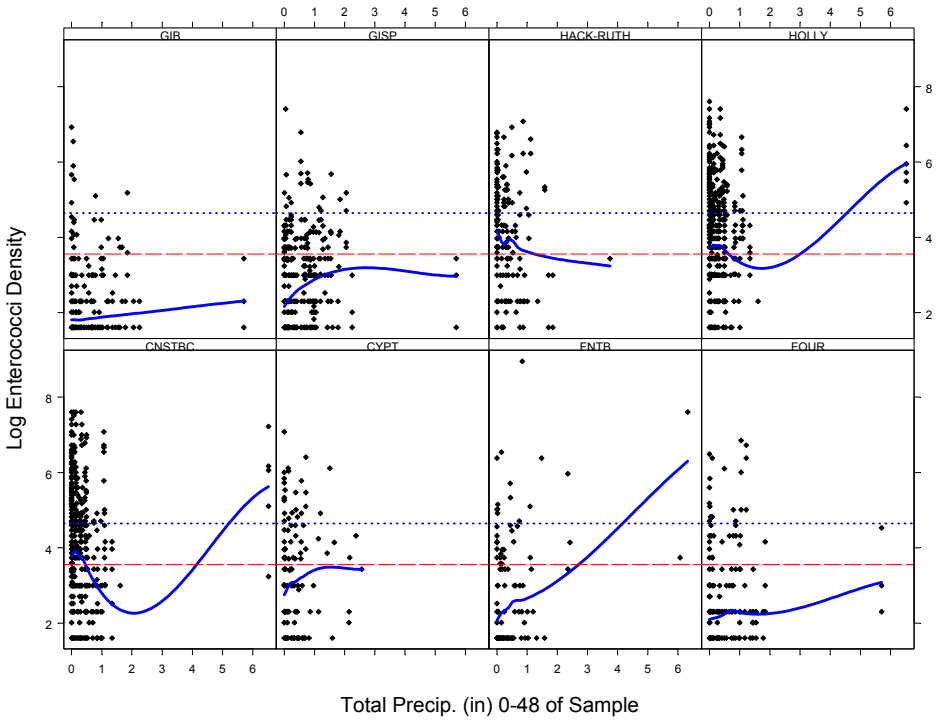


Figure 21. Relationship between $\log_e$ enterococci densities and precip48 shown as a loess line (solid blue line) within continuous beach segments relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines).

Enterococci density at CYPT was influenced by TideHNL, WindDirectionNSEW, a.numeric(WindSpeed) and precip48. The base model was set to high tide, calm winds, and no precipitation within 48 prior to sample collection. Under base model conditions, an enterococci density of 13 (3-52) was estimated. Under normal and low tides, enterococci densities of 6 (1-21) and 9 (2-41) were predicted. Winds out of the north increased enterococci density to 28 (14-55), while estimated enterococci density under the remaining possible wind directions (E, S, and W) were not different than calm. Increasing wind speed from calm to 0-5mph increased enterococci density to 16 (4-65) and an increase to 5-10mph resulted in an increase to 19 (4-85). Changing precip48 from 0 to 0.45 inches (the 75th percentile) resulted in an estimated increase to 16 (4-63).

For GISP, precip72, WindDirNSEW, and Sunny were the most influential environmental factors, with the base model conditions set to cloudy, calm winds and no precipitation in the 72 hrs. prior to sample collection. The estimated enterococci density for the base model was 14 (11-17). Changing precip72 from 0 to 0.76 inches (the 75th percentile) resulted in an estimate increase to 17 (14-22). Enterococci density is estimated to be lower when winds are out of the east and higher when out of the west, 9 (7-11) and 17 (12-23) respectively, than under calm conditions or when winds are from the north or south. Under sunny conditions, enterococci density is reduced from the base model estimate to 9 (6-11).

TideHNL, WindDirNSEW, a.numeric(WindSpeed) and precip0 were the influential environmental variables for GIB. The base model for GIB has an estimated enterococci density of 9 (7-12) for high tide, calm winds, and no precipitation within 48hrs prior to sample collection. Low and normal tides resulted in a lower enterococci density of 6 (5-9). Winds from the west were estimated to increase enterococci density to 13 (9-20) from calm conditions or from other wind directions. Increasing wind speed from calm to 0-5mph increased enterococci density to 11 (8-14) and an increase to 5-10mph resulted in an increase to 13 (9-18).

Model results for FOUR indicate that TideHNL, Sunny, WindDirNSEW, Salinity and precip48 were influential. The base model conditions were high tide, cloudy, calm winds, and 0 salinity and precip48. Low and normal tides and sunny conditions reduce estimated enterococci density to 7 (3-14). East and north winds reduced enterococci density estimates to 4 (2-8) and 5 (3-11) respectively, but winds from the west resulted in an increase to 25 (11-56). A 20 ppt increase in salinity was estimated to increase enterococci density to 14 (10-21). Changing precip48 from 0 to 0.45 inches (the 75th percentile) resulted in no change in enterococci density estimates, but a rare extreme rain event of 6 inches was estimated to result in an increase to 20 (6-67).

The regional model for the Grand Isle Area Group explained only 8 percent of the total variability in observed enterococci density, much less than the GISP, GIB an FOUR continuous beach segment models. This suggests that the enterococci densities may be responding to environmental conditions differently at those beach segments. The single most influential environmental factor operating at the regional scale was wind direction, with enterococci densities estimated to double when winds were from the west.

The model for HACK-RUTH indicated that WindDirNSEW, as.numeric(WindSpeed), Salinity and precip72 influence enterococci density. The base model set wind direction to east, and wind speed, salinity and precip72 to 0, with an expected enterococci density of 66 (31-141). When winds were from the north, enterococci density was expected to be lower, and when winds were from the west, densities were higher (47 [23-98] and 221 [90-540] respectively); enterococci density during south winds were about the same as the base model east winds.. Increases in wind speed were also expected to increase enterococci densities, with an increase in speed from calm to 0-5mph resulting in an increased enterococci density of 92 (47-182) and an increase to 5-10mph resulted in an increased density of 129 (68-246). A 20 ppm increase in salinity resulted in a reduction in estimated enterococci density to 35 (21-61), and changing precip72 from 0 to 0.76 inches (the 75th percentile) resulted in an estimated increase to 50 (24-105).

Enterococci density at HOLLY was influenced by TideHNL, Salinity, and WindDirNSEW and as.numeric(WindSpeed) and their interaction. The HOLLY base model set included high tide, calm east winds, and 0 ppt salinity with an enterococci density of 65 (34-123). Enterococci density at high and normal tides were the same, but low tide resulted in reducing density to 40 (21-76). A 20ppt increase in salinity resulted in a larger reduction in enterococci density to 28 (16-48). The influence of wind direction and wind speed were more complex to interpret due to their interaction, that is, the effect of wind direction differed with wind speed. The influence of wind direction and wind speed on enterococci density is shown graphically in Figure 22. Winds from the south resulted in relatively high enterococci densities regardless of wind speed, but

winds from the north and west resulted in relativity low enterococci densities at low wind speeds (53 (32-88) and 14 (3-60), respectively) but increased with wind speed, especially with winds from the west, which resulted in extremely high enterococci densities of 1693 (578-4962).

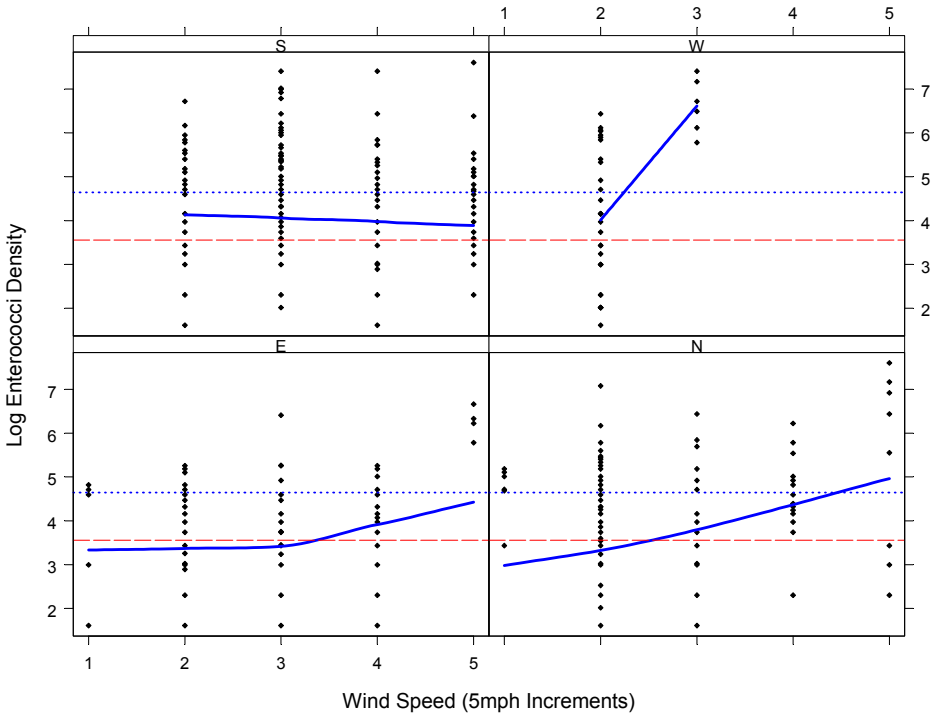


Figure 22. Interaction between wind direction (E, N, S, W) and wind speed on $\log_e$ enterococci density for HOLLY shown as a loess line (solid blue line) relative to geometric mean criterion (red dashed lines) and single sample maximum criterion (blue dotted lines). Wind speed 1 = calm winds, 2-5 are 5mph increments from 0 (category 2=0-5mph).

At CNSTBC, enterococci density was influenced by the environmental variables Sunny, WindDirNSEW, as.numeric(WindSpeed) and Salinity. The base model was set to cloudy conditions, calm east winds, and 0 salinity, and resulted in an estimated density of 77 (43-139). Under sunny conditions, estimated enterococci density decreased to 37 (18-79). A 20 ppt increase in salinity resulted in an even greater reduction in enterococci density, with an estimated value of 24 (16-35). Winds from the north or south were expected to increase enterococci density about 40% (120 [64-223] and 104 [57-189] respectively), but winds from the west more than doubled the expected density to 190 (92-390). Increasing wind speeds were also expected to increase enterococci densities, with an increase in speed from calm to 0-5mph resulting in an increase to 107 (62-85) and to 5-10mph resulting in an increased density of 150 (88-254).

The regional model for the Cameron Parish area group, which included HACK-RUTH, HOLLY and CNSTBC, fit the data much better than the Grand Isle area group model. The Cameron Parish area group model had an R^2 comparable to those for HOLLY and CNSTBC, suggesting that the influential environmental factors may have been operating at a regional scale. The influential environmental variables were TideHNL, Sunny, Salinity preciplag1, and

WindDirNSEW and as.numeric(WindSpeed) and their interaction, with an estimated enterococci density of 79 (50-125) when base conditions are set to high tide, cloudy, 0 Salinity and preciplag1, and calm east winds. Enterococci density at low tide was estimated to be slightly lower (63 [40-100]) at low tide, and slightly higher at normal tide (87 [56-137]). Sunny conditions were expected to reduce enterococci density to 46 (27-78), and a 20 ppt increase in Salinity was also expected to reduce the density (31 [21-46]). Changing preciplag1 (total precipitation within 24-48 hrs. prior to sampling) from 0 to 0.12 inches (the 75th percentile) resulted in a minor decrease to 73 (46-115). Wind direction and speed appeared to interact regionally, similar to the conditions at HOLLY, with relatively high enterococci densities but constant across wind speeds when winds were from the south (141 [93-214] and 175 [121-224] at calm and 5-10mph wind speeds). At 5-10mph wind speeds, enterococci density for north winds (182 [128-257]) were comparable to south winds, but west winds resulted in a substantial increase in density to 1014 (467-2200).

Predictive models provided insight into the relative influence of environmental conditions on enterococci density at continuous beach segments and regionally at beach areas groups, however, the source for the persistently high enterococci densities that have been observed at the Cameron Parish beaches remains a mystery. In spite of considerable effort, no source for the high enterococci densities has been identified, although several hypotheses have been developed through discussions between LDHH and LDEQ staffs. Those hypotheses are that the source of the high enterococci densities is due to: 1) local discharges at each beach; 2) a single major discharge affecting all beaches; 3) offshore sources; or 4) unique edaphic factors along the Cameron Parish coastline.

The local sources hypothesis is believed to be unlikely. A sanitary survey of the Cameron Parish beaches was conducted at the start of the program and did not identify any major sources of potential contamination. This hypothesis is also logically unlikely, as it would require similar levels of contaminated discharge across all of the Parishes' beaches in spite of the substantial differences in the size of the local population at each beach. Additionally, if the source were associated with the local population, then enterococci density would be expected to change with changes in the local human population. However, enterococci densities were unchanged after significant changes in human population following Hurricane Rita in 2005.

The major discharge hypothesis also now seems unlikely. There are only two river systems with flows sufficient to impact the entire Parishes' coastline: the Calcasieu River discharging east of the midpoint between the Parishes' beaches, and the Sabine River on the western border of the Parish. Because there is a westward flow in the Gulf of Mexico along the Louisiana coast, and there is not a strong east-west enterococci density gradient among the Parishes' beaches, the centrally located Calcasieu River would be the most likely source if this hypothesis were true. To investigate the major discharge hypothesis, LDEQ collected four samples between 18 June and 29 July 2008 at each of eight locations. The sample locations were distributed as follows: two inland from the Calcasieu River outlet; one at the mouth of the river; one location two miles offshore from the mouth; and one each near-shore and two miles offshore at locations seven miles east and west of the river's mouth (Figure 23). Enterococci geometric means for samples collected at LDEQ sample stations and BEACH Program sample stations during the same period are shown in Figure 23. Because of small sample sizes and large variances in enterococci

densities among samples collected at most sample stations (Appendix E), the enterococci results can be organized into three statistical groups: offshore stations (3768, 3770 and 3772), which are less than river stations (3765 and 3766), which are less than near-shore stations (all remaining stations). Therefore, the enterococci geometric means near shore are greater than those observed within hypothesized major discharge, suggesting that the major discharge hypothesis is unlikely.

The Calcasieu River study also addressed the offshore operations hypothesis. There are a number of offshore oil production platforms that could theoretically discharge high levels of fecal contamination. However, this hypothesis was doubtful as the volumes of discharge that would be required to produce the enterococci densities observed at the Cameron Parish beaches would be unlikely, even if the majority of the platforms were not operating in compliance with discharge regulations. The results of the Calcasieu River study confirm that this hypothesis is unlikely.

The remaining untested hypothesis is that the observed high enterococci densities at the Cameron Parish beaches are a function of unique edaphic factors along the Cameron Parish coastline. Cameron Parish beaches are the only Louisiana BEACH Program stations with a large semi-contained intermediate salinity marsh area behind a 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 at the LDHH Beach Program sample stations than the near-shore samples collected 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, it is likely to take many years before sufficient data are available to develop models that can reliably predict enterococci densities at Louisiana's beaches. It appears that different environmental factors are most correlated with enterococci density for different beach segments, and that 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. Louisiana beaches are somewhat different from those of most other coastal states in that they represent a wide range of salinity conditions and all sites monitored to date are relatively remote from urban runoff.

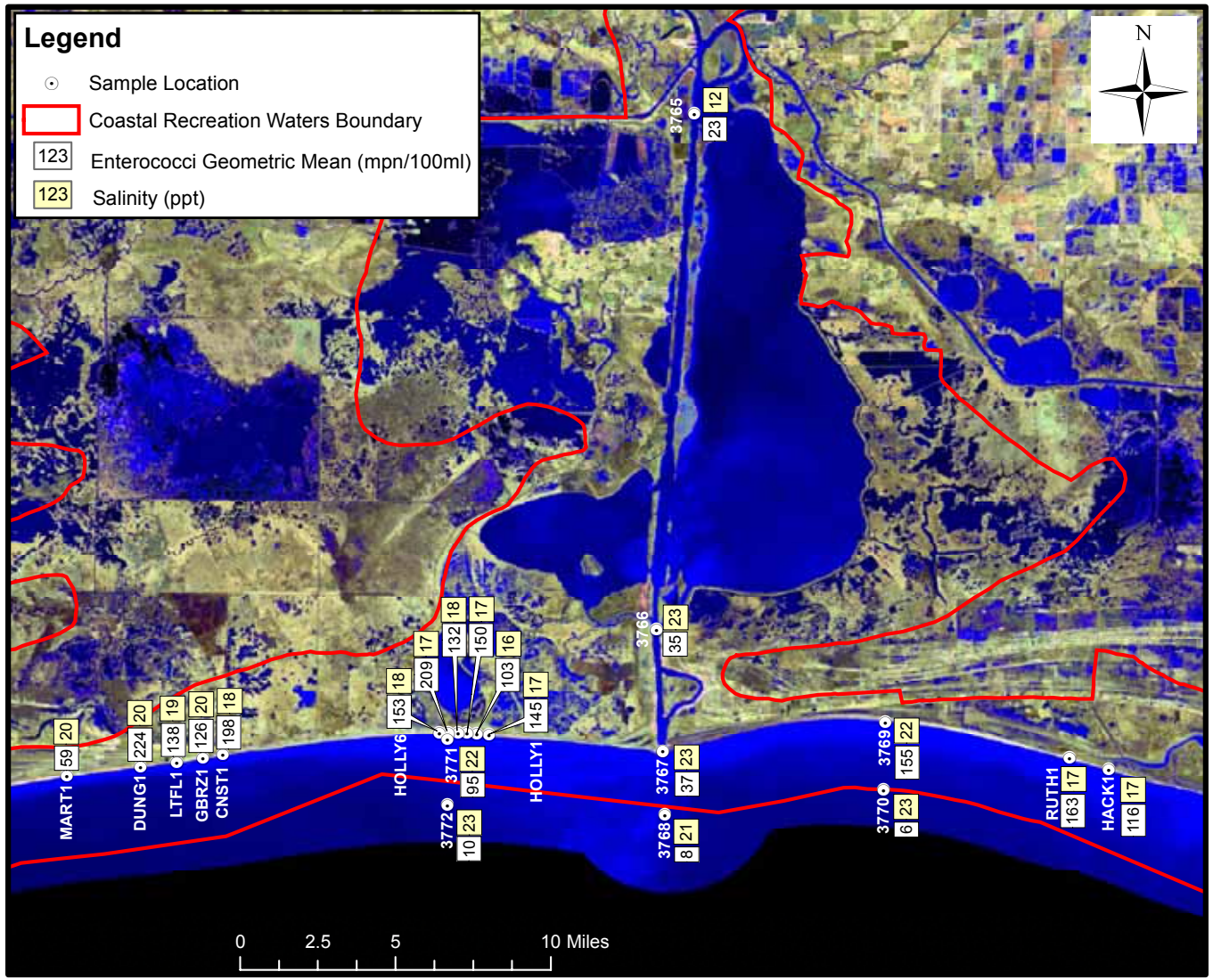


Figure 23. Enterococci geometric means (mpn/100ml) and salinity (ppt) results for samples collected between 18 June and 29 July 2008 at LDEQ sample stations for the Calcasieu River Study and BEACH Program sample stations.

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

Louisiana's BEACH Program Quality Assurance Project Plan (LDHH 2008) 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 2008 results.

Table 14. Data quality objectives and results of 2008 sampling.

Parameter	Concen-tration Units	QAPP Precision Goals (RPD)	2008 Precision Mean RPD (± 1 SE, n)	QAPP Completeness Goals	2008 Completeness
Enterococci	MPN/ 100ml	Sample 60%; lab 30%	Sample 50.8% (±8.6, 29); lab 55.1% (±7.2, 36)	98%	100%
Fecal Coliform	MPN/ 100ml	Sample 60%; lab 30%	Sample 59.8% (±10.5, 29); lab 50.3% (±8.4, 36)	98%	100%
Salinity	ppt	Sample 10%, lab 5%	Sample 4.7% (±3.2, 29); lab 4.7% (±1.5, 35)	98%	98.6%
Surface Water Temperature	°F	$\pm$ 2°	$\pm$ 2° by SOP	98%	99.6%
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), sample and laboratory precision for indicator organism densities and salinity were assessed by comparing the results from routine sample, calibration or resample results with 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 2008, a total of 67 quality control samples were scheduled to be collected along with the 626 routine samples and 27 calibration samples that were collected. The 67 scheduled quality control samples were to consist of 30 field duplicates and 37 field split samples. Twenty-eight (28; 93%) field duplicates were sampled as scheduled and 35 (95%) field split samples were collected as scheduled, resulting in 94% of scheduled QC samples collected. In addition to the scheduled quality control samples, two extra quality control samples were collected (1 field duplicate and 1 field split) in conjunction with routine sample events.

To evaluate compliance with QAPP precision goals, means and standard errors of sample RPDs were calculated for the 2008 QC samples and are presented in Table 16. Figures 24-26 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 fully achieved for 2008 fecal coliform and enterococci field duplicates, and all salinity QC samples. However, QC goals for fecal coliform and enterococci field splits were not met. The field split sampling precision goal for fecal coliform and enterococci are 30% RPD but the observed lab RPD exceeded that goal by an estimated 67% and 83%, respectively. In fact, the 2008 QC results for fecal coliform, enterococci, and salinity were not statistically different between field duplicates, which incorporate environmental, sample handling, and lab analysis variability, and field splits, which incorporate only sample handling, and lab analysis variability. This suggests that field samplers need to take greater care in the preparation of field split samples in the future, ensuring thorough mixing before splitting the sample into the two aliquots. If these results are not the result of sample handling, then the small difference in RPDs between field splits and field duplicates suggests that the majority of the observed variability is the result of the precision limits of the analysis method with only a small portion of the variability attributable to natural variability in the water column at a given location and time. If this proves to be the case, 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 2008, all of the 691 samples collected were successfully processed and the results considered valid and recorded in the Program's database, except for 3 missing water temperature

and 10 missing salinity records. Accordingly, all completeness goals for 2008 were fully achieved.

In addition to the above audit, the BEACH Program Manager/Quality Assurance Officer verified throughout the 2008 sampling period that:

- All elements of the QAPP were being correctly implemented as prescribed;
- 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.

No inconsistencies with the QAPP were detected during 2008. All monitoring and notification data collected during 2008 have been uploaded to EPA's BEACH (PRAWN) and STORET data systems via WQX submission of an XML formatted file.

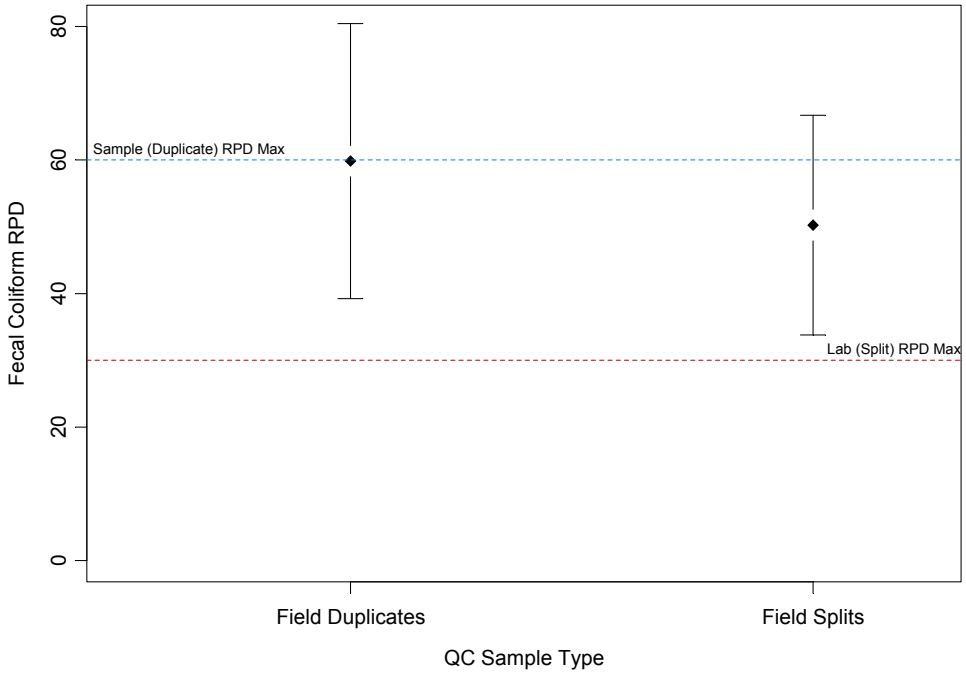


Figure 24. Comparison of 2008 monitoring season mean fecal coliform relative percent difference (RPD) for field duplicates and field splits with QAPP precision goals. Means are represented by diamonds, and upper and lower 95th percentiles of the mean are shown as error bars.

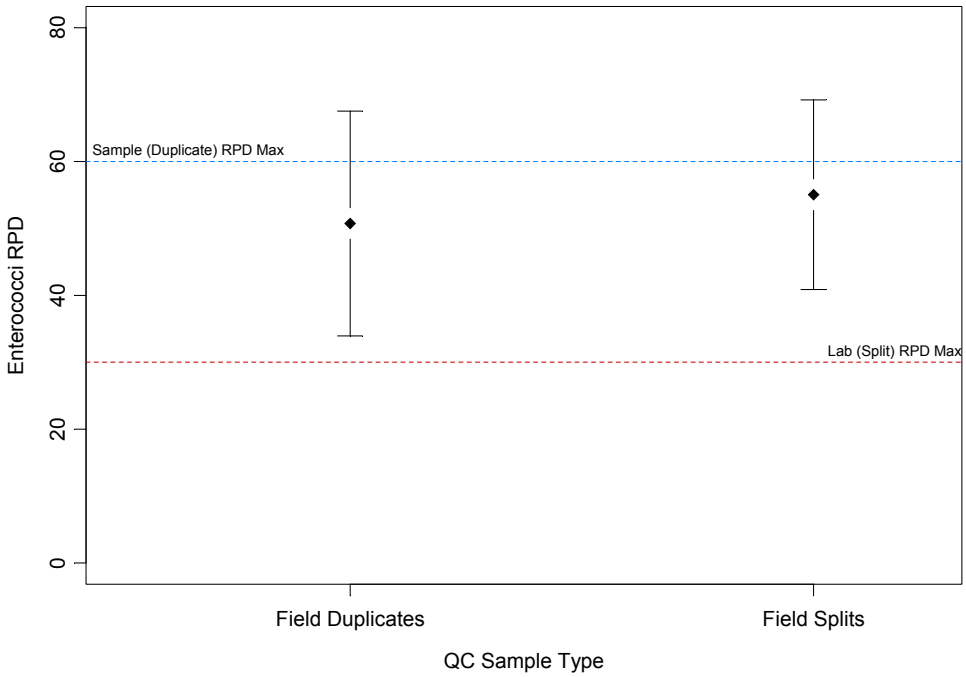


Figure 25. Comparison of 2008 monitoring season mean enterococci relative percent difference (RPD) for field duplicates and field splits with QAPP precision goals. Means are represented by diamonds, and upper and lower 95th percentiles of the mean are shown as error bars.

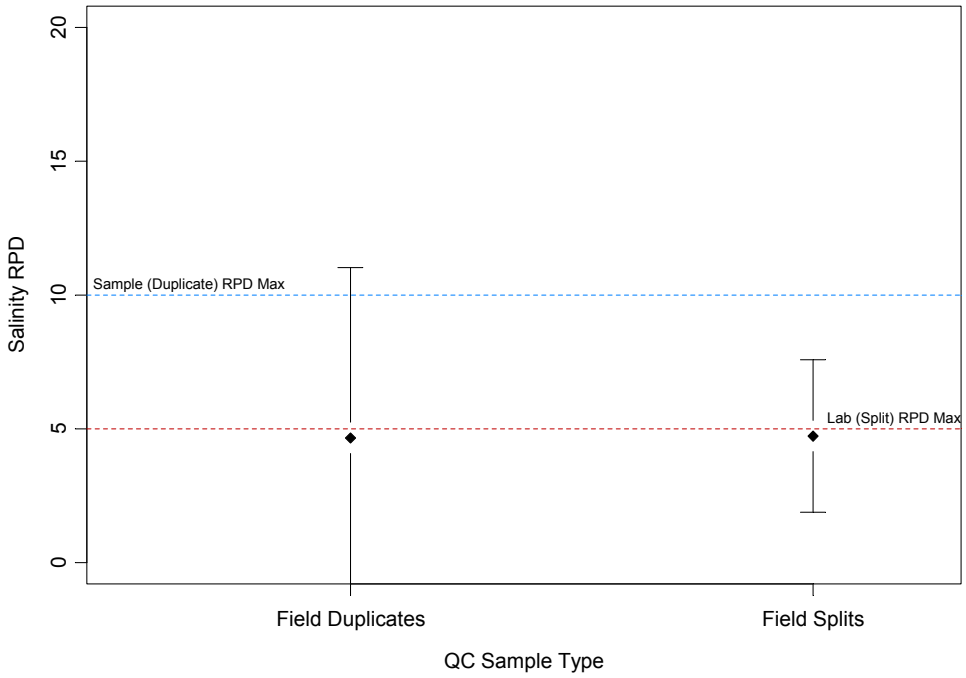


Figure 26. Comparison of 2008 monitoring season mean salinity relative percent difference (RPD) for field duplicates and field splits with QAPP precision goals. Means are represented by diamonds, and upper and lower 95th percentiles of the mean are shown as error bars.

REFERENCES

Burnham, K.P., and D.R. Anderson. Model Selection and Inference:1998. A Practical Information – Theoretic Approach. Springer-Verlag, New York, NY.

Louisiana Department of Health and Hospitals. 2003. Louisiana's BEACH Grant Final Report, Grant Year 2001. Louisiana Department of Health and Hospitals, Office of Public Health.

Louisiana Department of Health and Hospitals. 2007. Louisiana's BEACH Program Quality Assurance Project Plan; Version 2.b. Louisiana Department of Health and Hospitals, Office of Public Health.

Byappanahalli, M.N., R.L. Whitman, D.A. Shively, W.T.E. Ting, C.C. Tseng and M.B. Nevers. 2006. Seasonal persistence and population characteristics of Escherichia coli and enterococci in deep backshore sand of two freshwater beaches. Journal of Water and Health 04.3:313-320. Available at http://www.iwaponline.com/jwh/004/0313/0040313.pdf, accessed on 19 March 2008.

USEPA. 2002. *Implementation Guidance on Water Quality Criteria for Beaches. Draft. May 2002*. EPA-823-B-02-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Venables, W.N., and B.D. Ripley. Modern Applied Statistics with S – Fourth Edition. Springer. USA.

WHO. 2003. Guidelines for safe recreational water environments. Volume 1, Coastal and fresh waters. World Health Organization. Available at http://www.who.int/water_sanitation_health/bathing/srwg1.pdf, accessed on 8 Fe. 2008.

APPENDIX A

Sample Station Names and EPA IDs

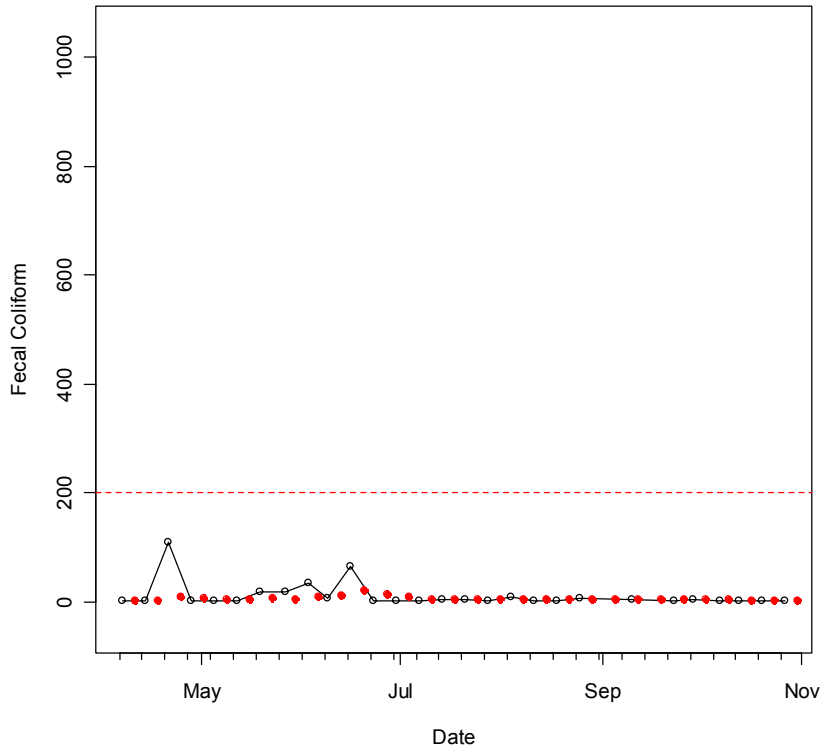
List of sample stations designated under the Louisiana BEACH Program by State ID, Beach Name, and USEPA IDs.

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



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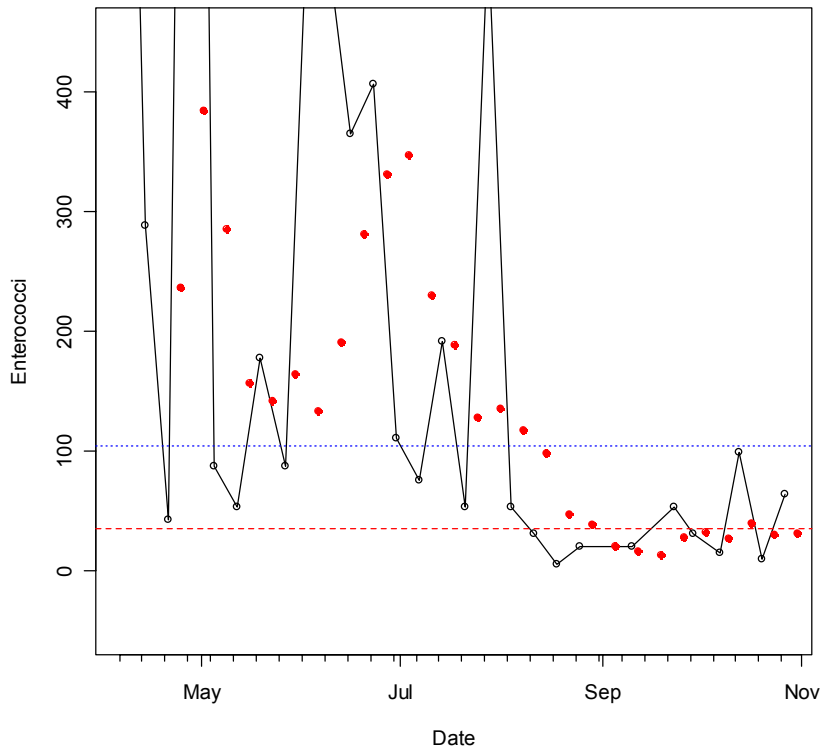
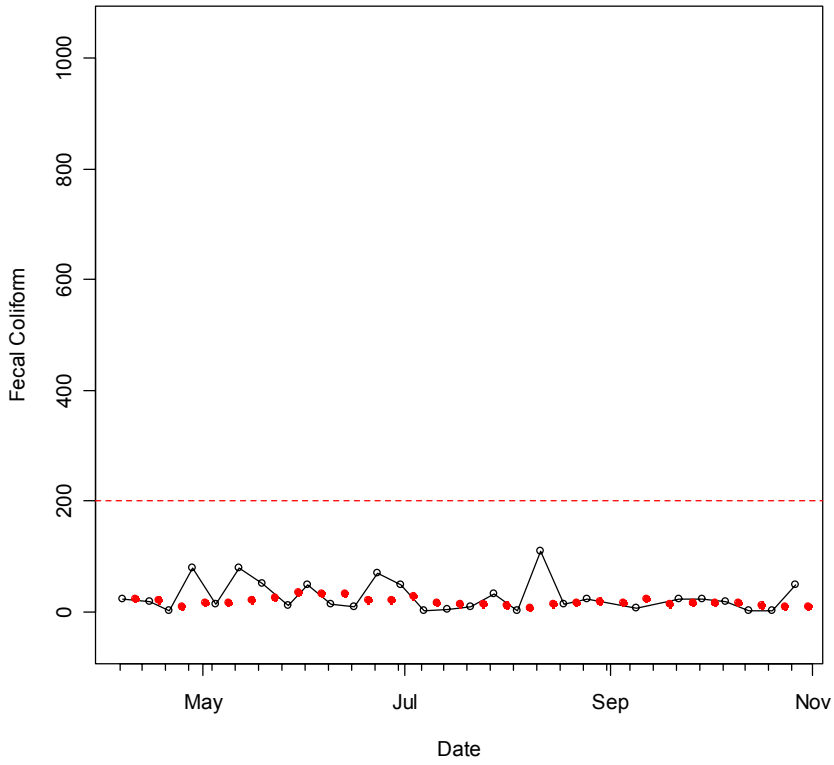


Figure B.1. Time series of fecal coliform (A) and enterococci (B) sample results collected during 2008 at CNST1. Sample results are shown as open dots (○), running 30-day geometric means are shown as red dots (●), and geometric mean and single sample maximum criteria are shown as red and blue dashed horizontal lines, respectively.

A



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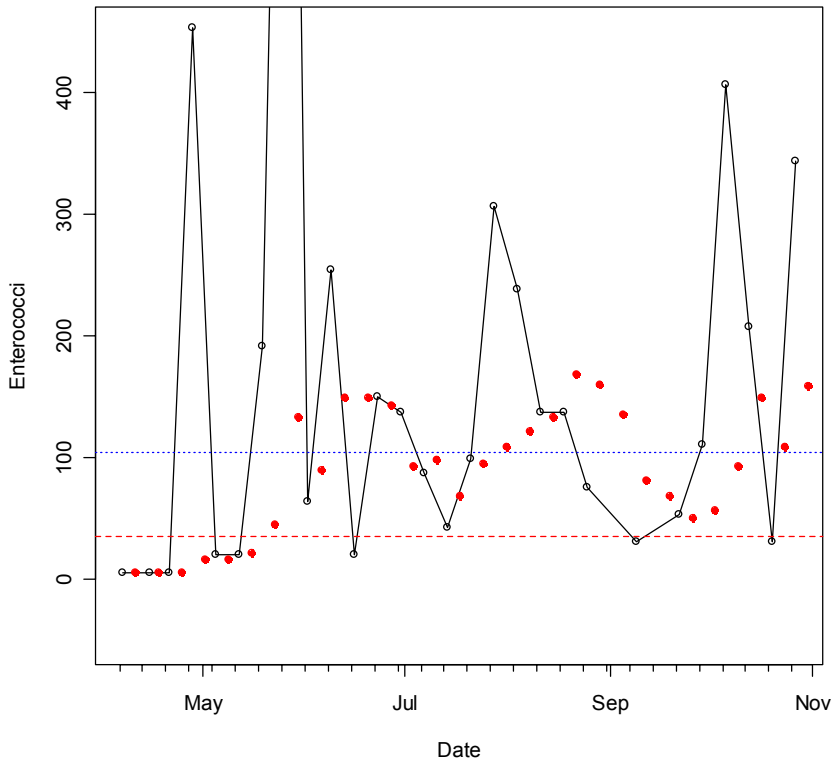
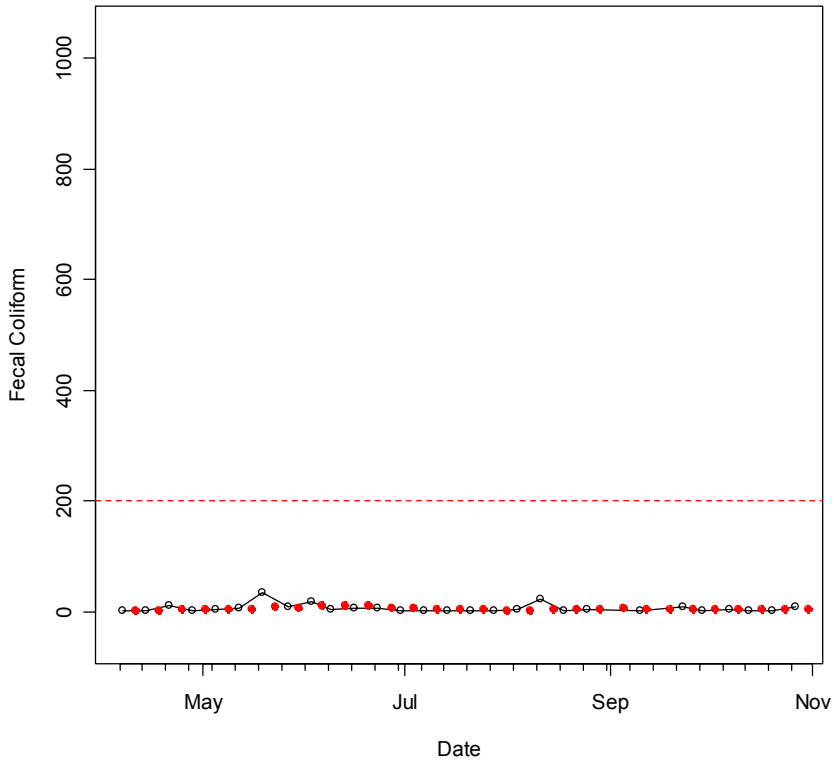


Figure B.2. Time series of sample results collected during 2008 at CYPT1.

A



B

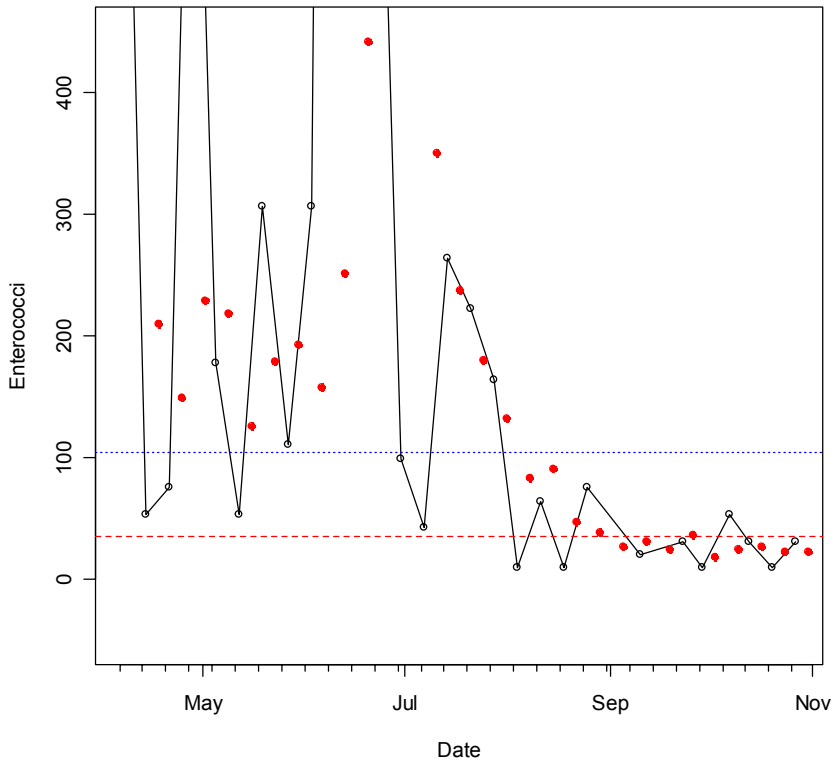
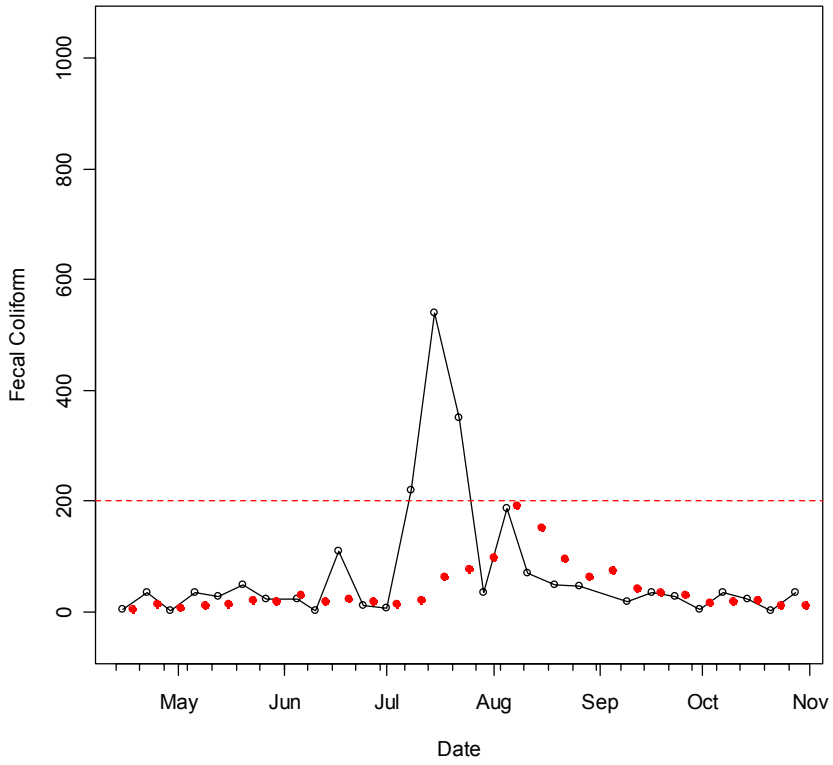


Figure B.3. Time series of sample results collected during 2008 at DUNG1.

A



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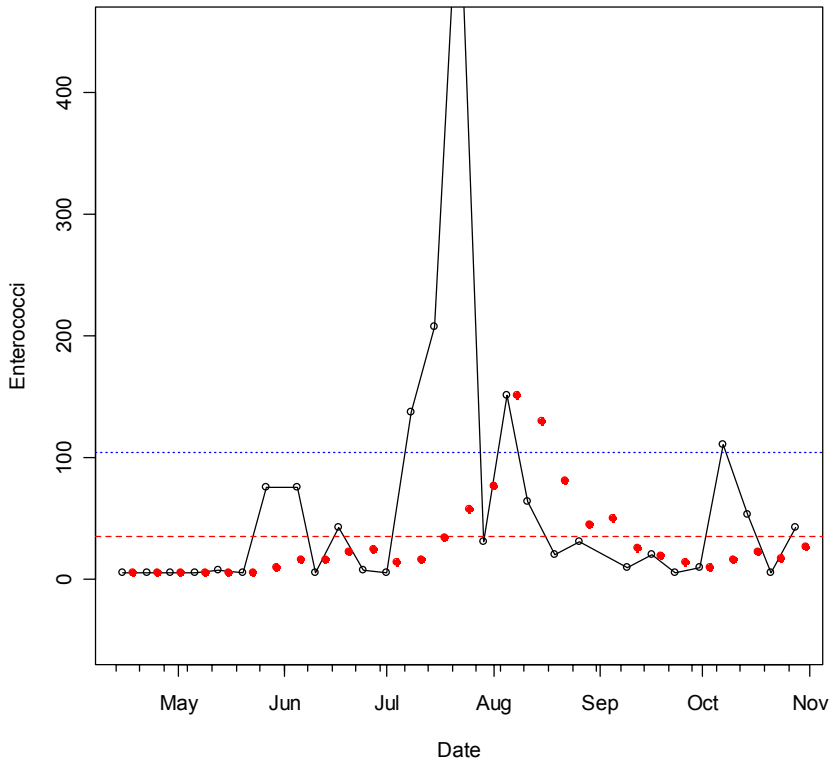
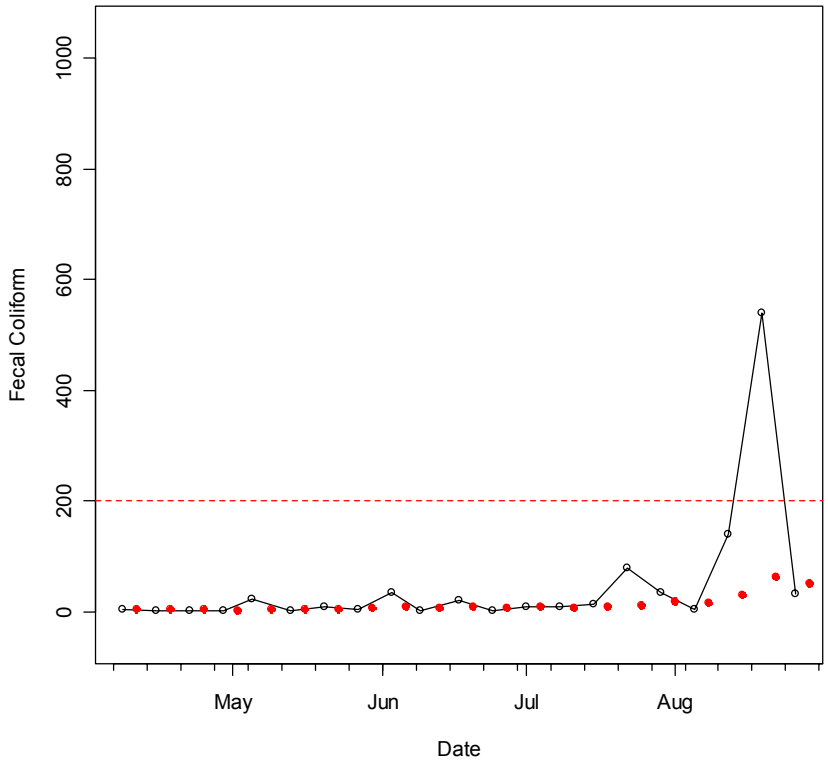


Figure B.4. Time series of sample results collected during 2008 at FNTB1.

A



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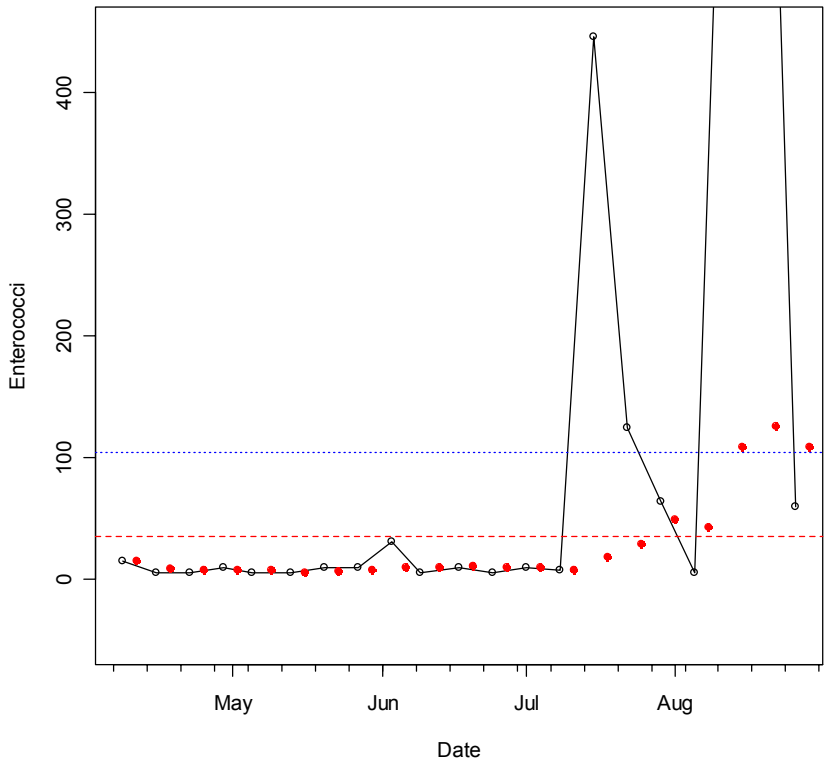
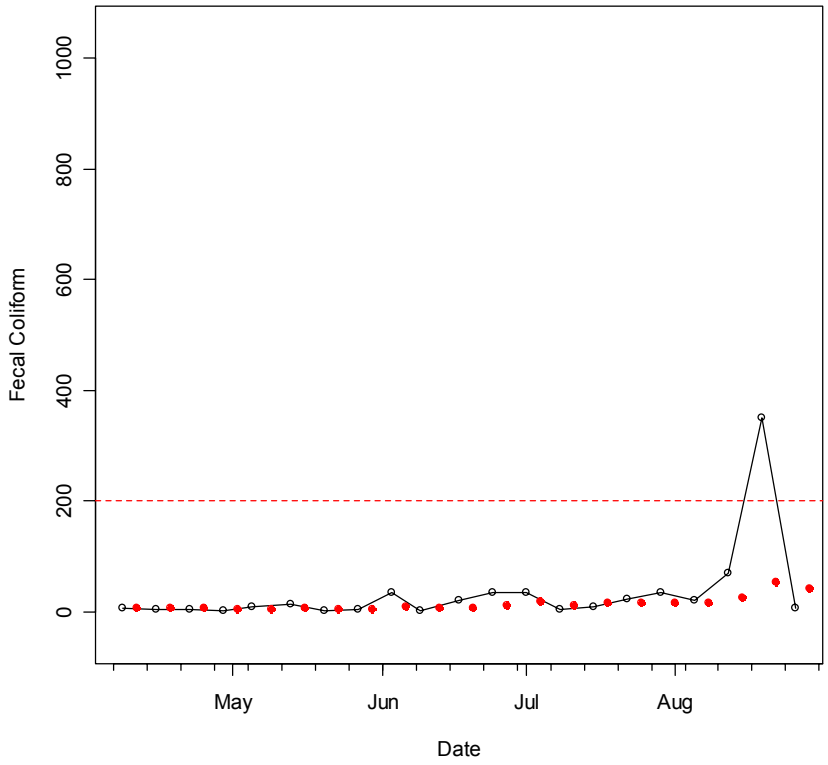


Figure B.5. Time series of sample results collected during 2008 at FOUR1.

A



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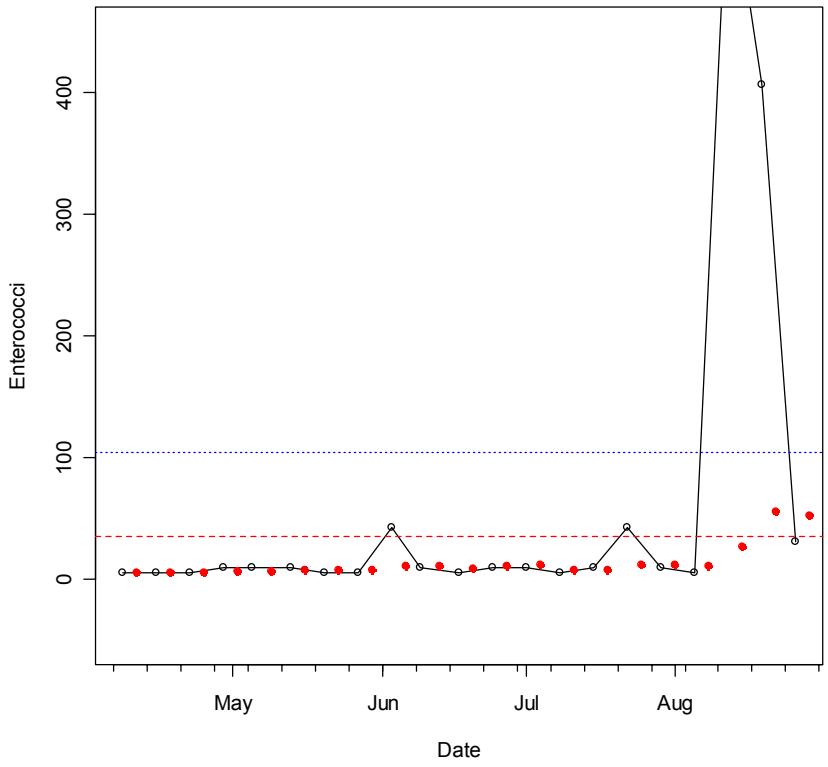
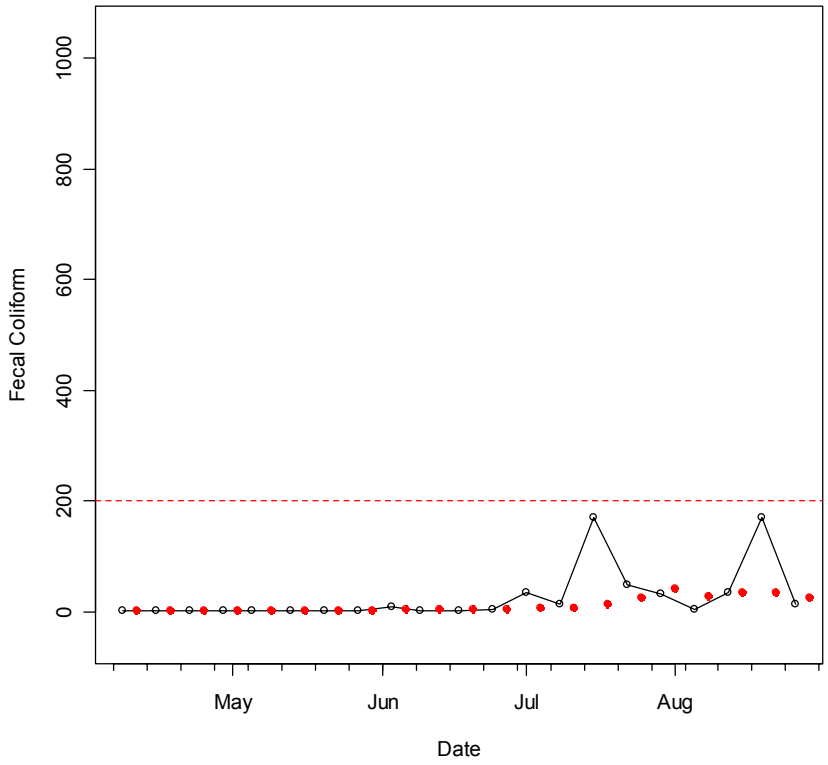


Figure B.6. Time series of sample results collected during 2008 at FOUR2.

A



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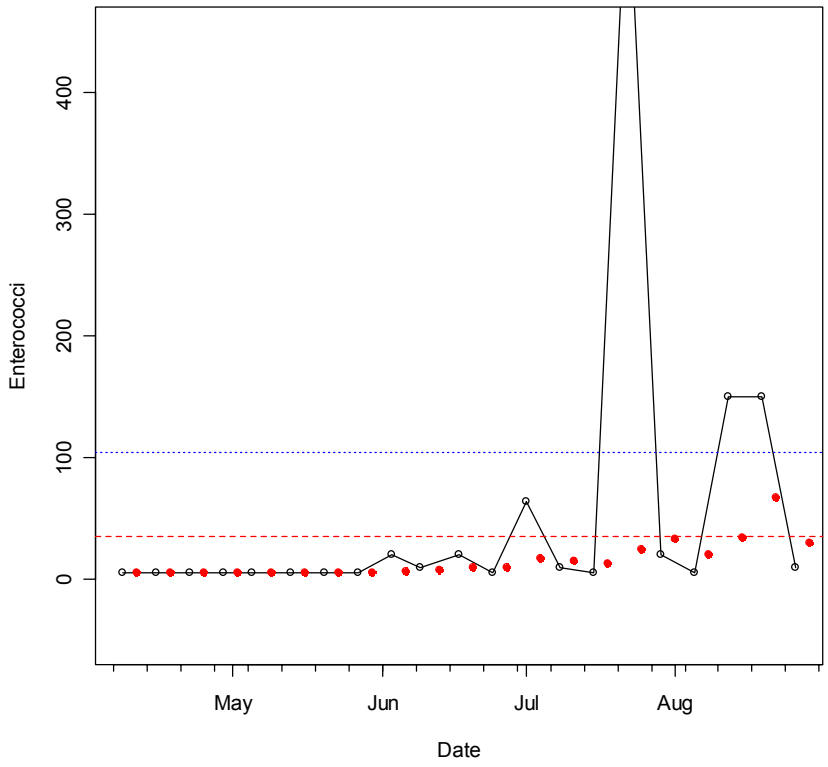

Figure B.7. Time series of sample results collected during 2008 at FOUR3.

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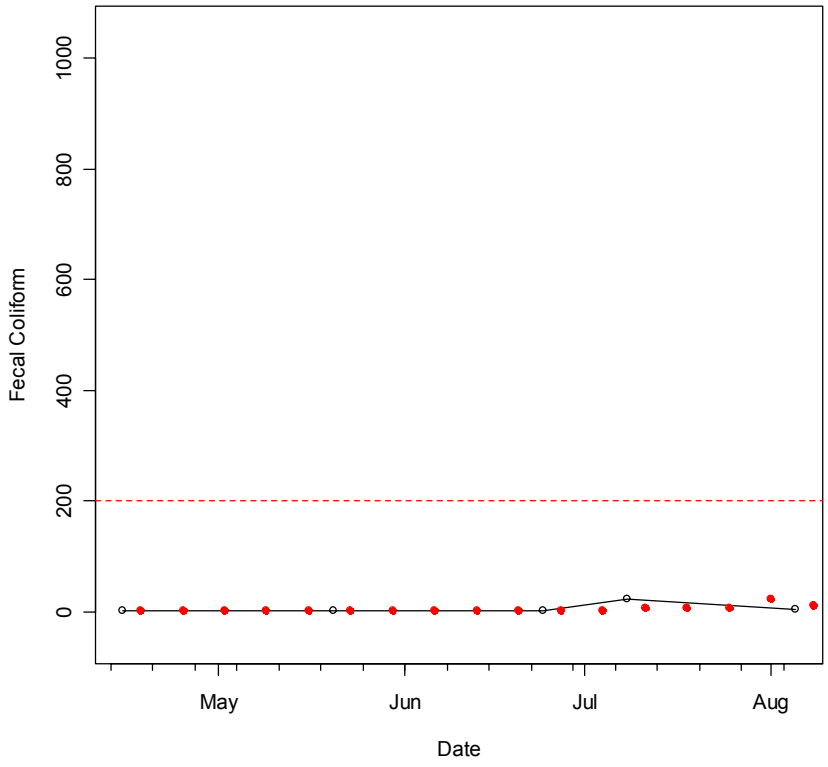

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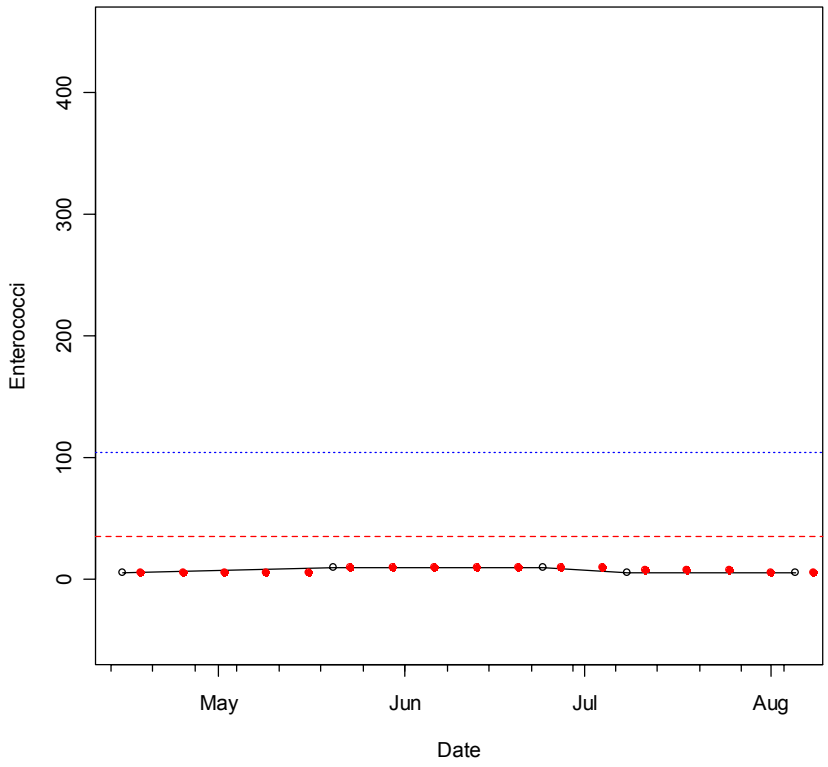
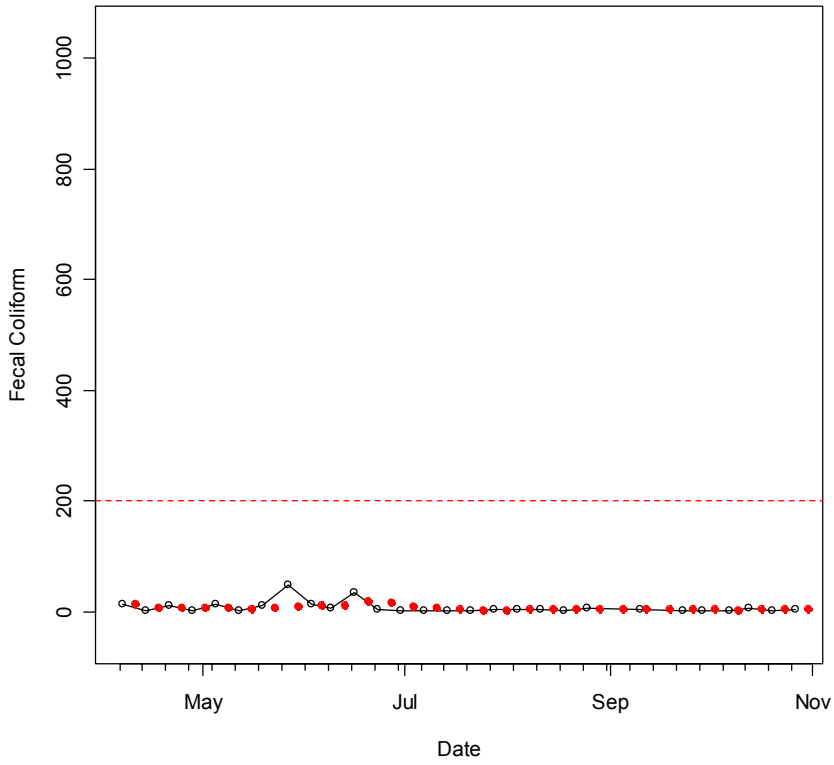


Figure B.8. Time series of sample results collected during 2008 at FOUR4.

A



B

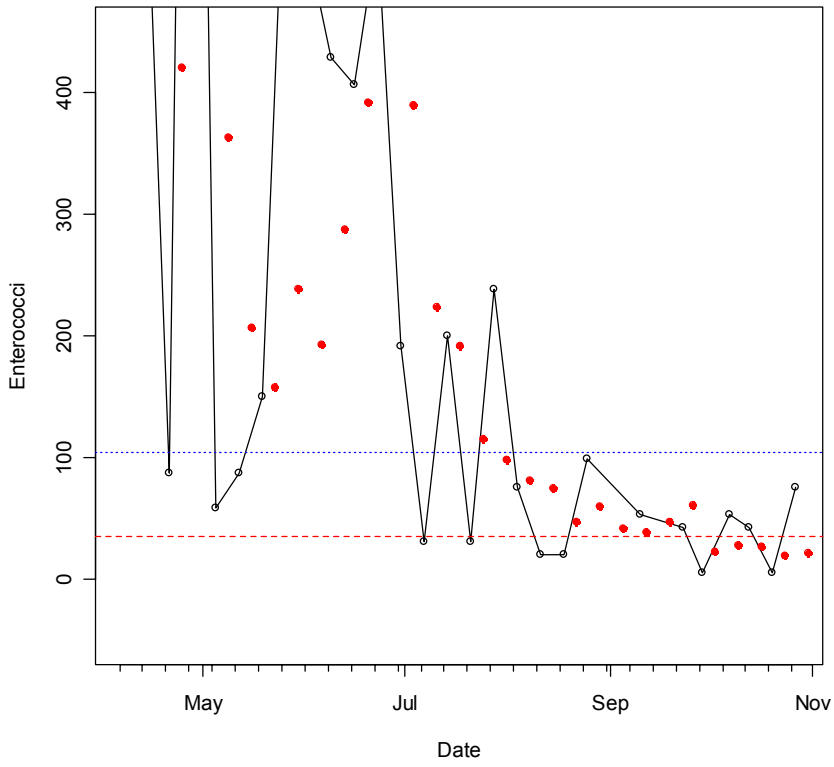


Figure B.9. Time series of sample results collected during 2008 at GBRZ1.

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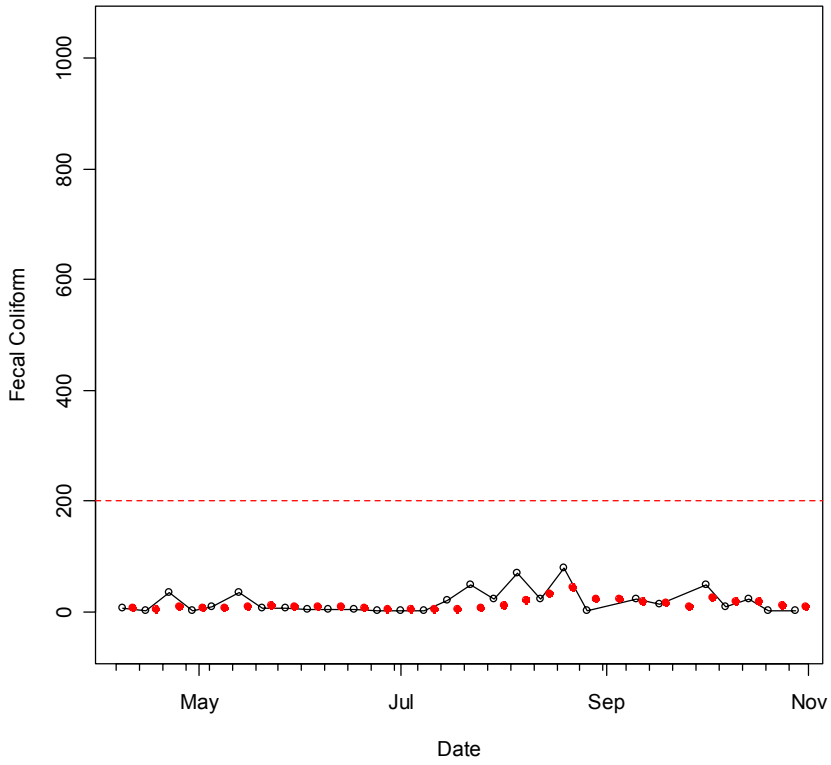

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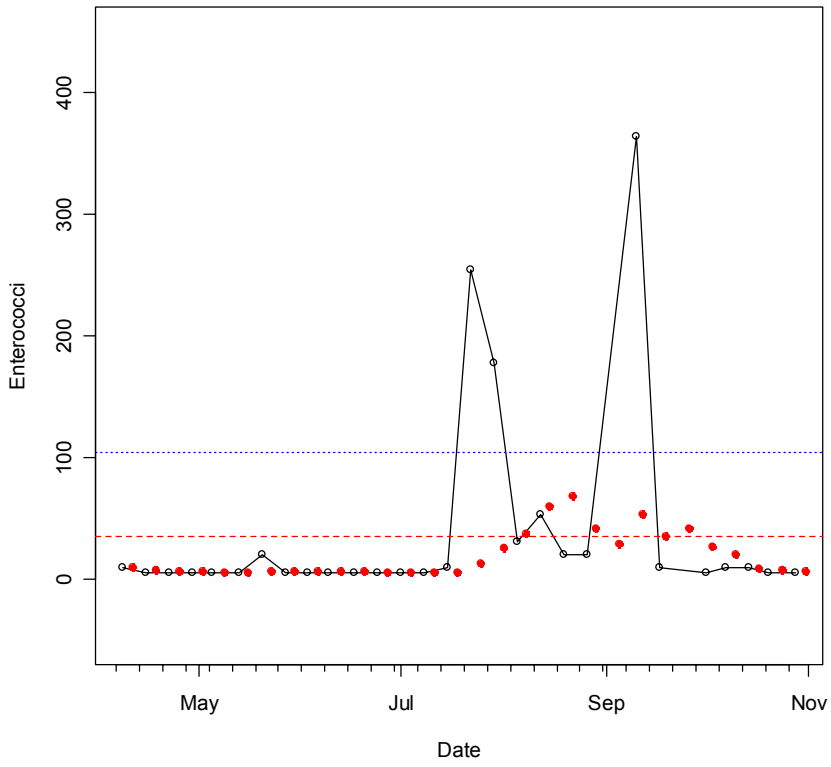
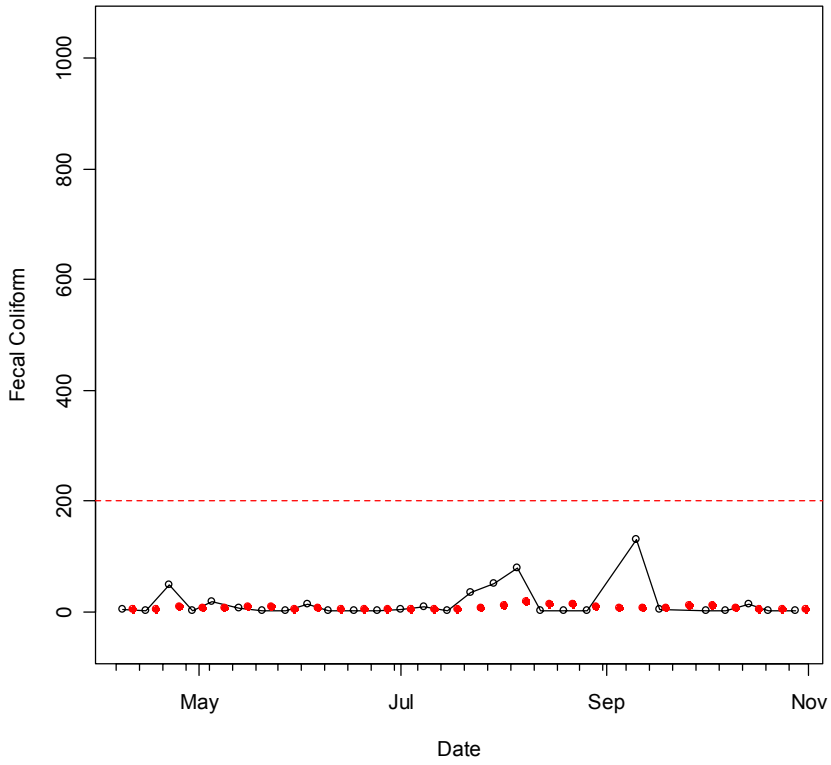


Figure B.10. Time series of sample results collected during 2008 at GIB1.

A



B

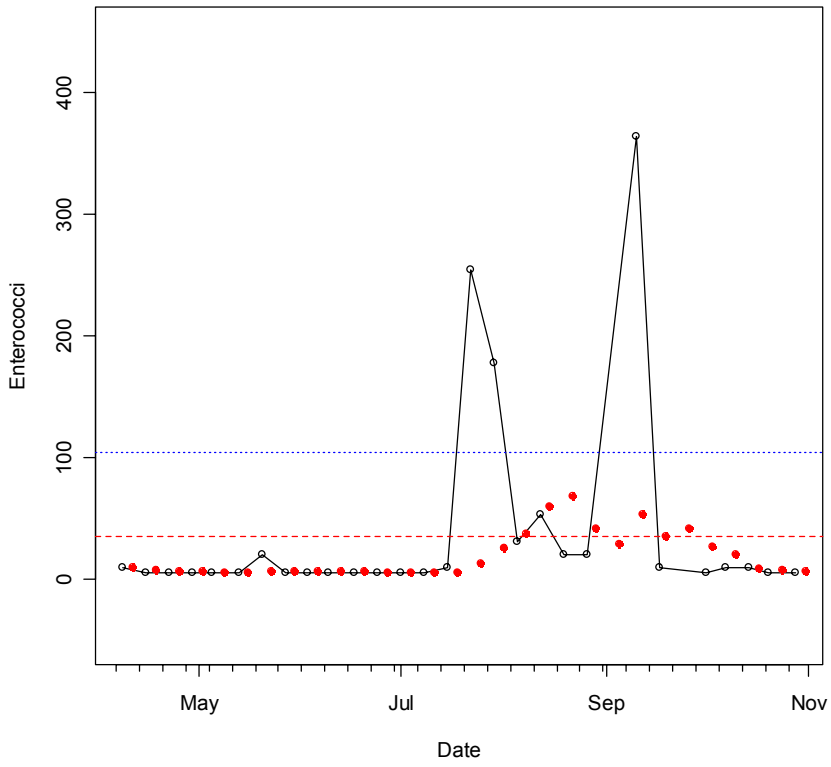
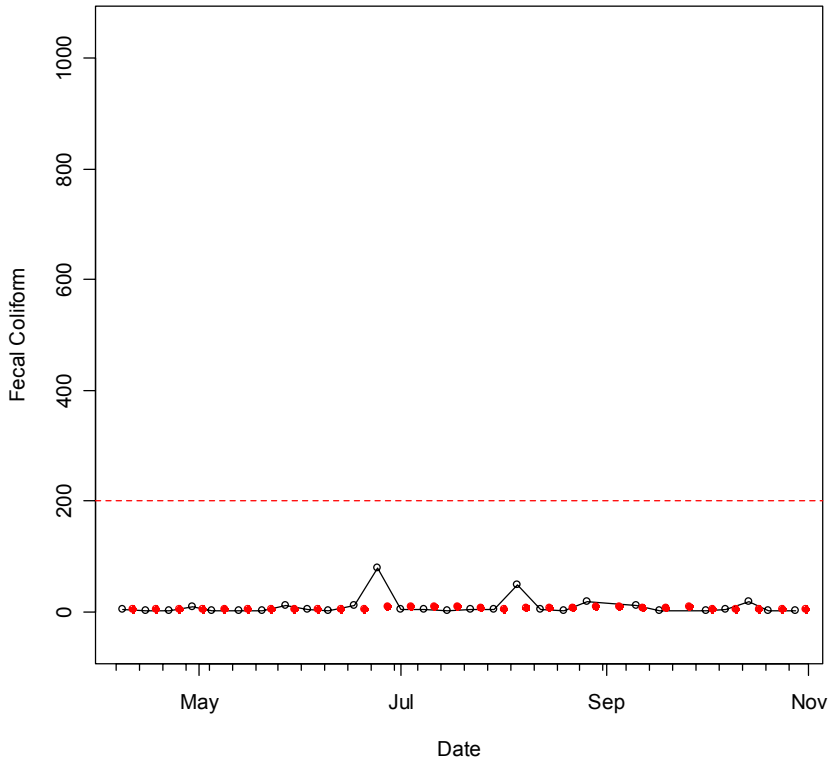


Figure B.11. Time series of sample results collected during 2008 at GIB2.

A



B

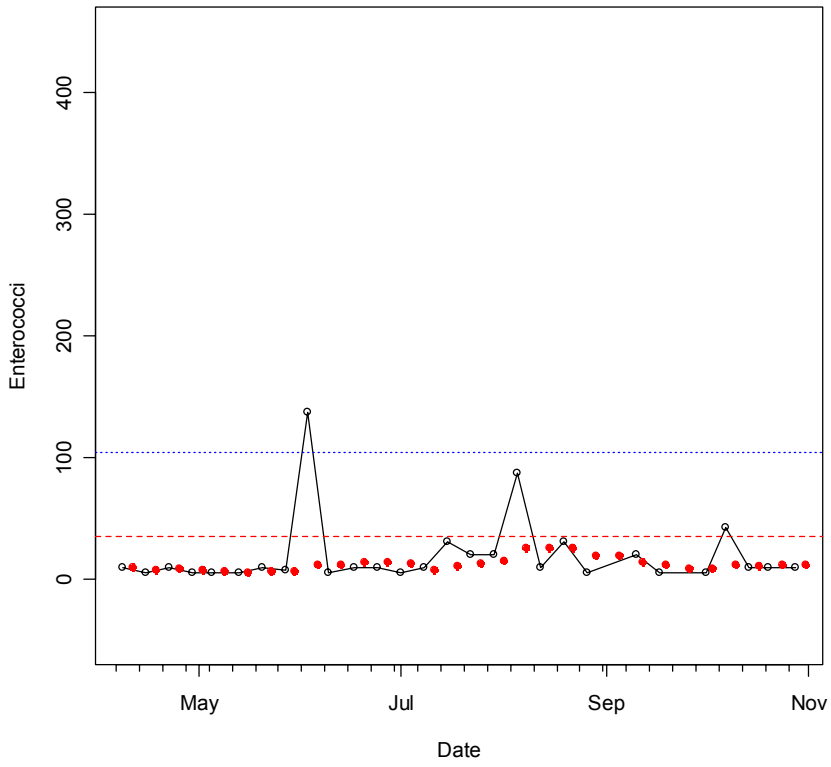
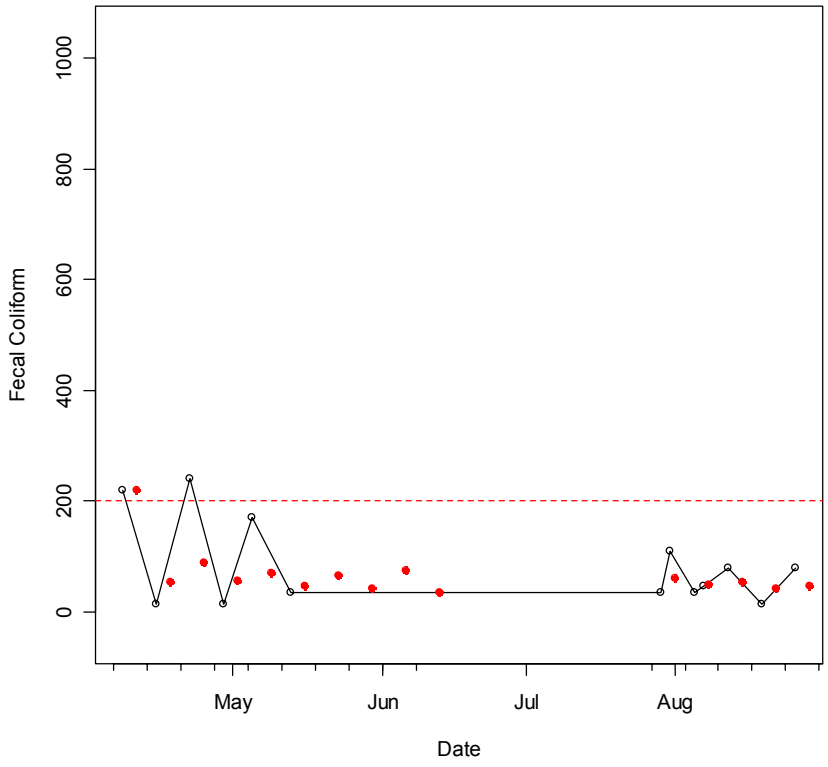


Figure B.12. Time series of sample results collected during 2008 at GIB3.

A



B

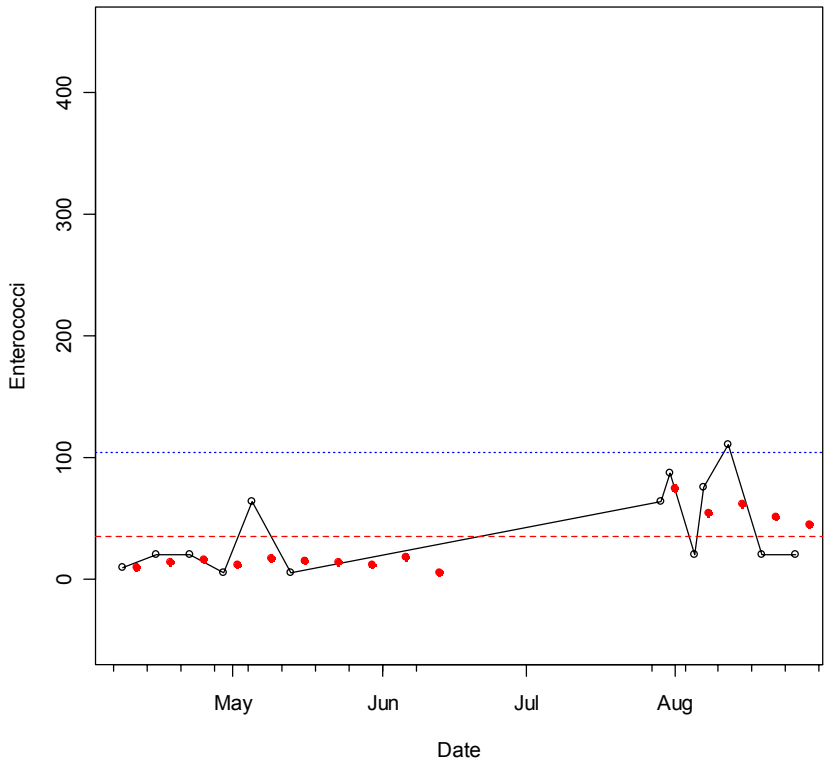
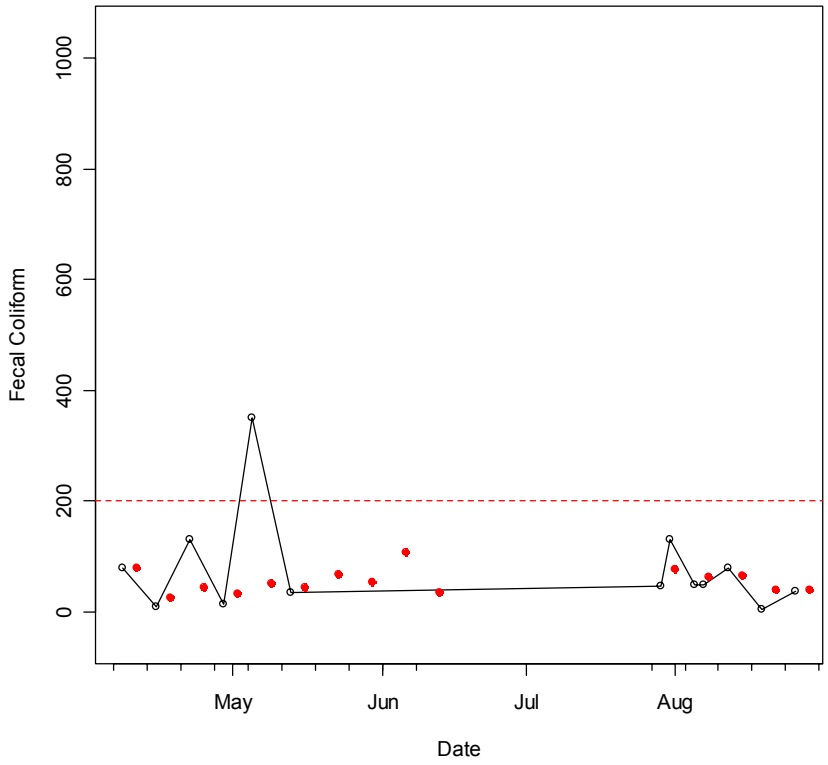


Figure B.13. Time series of sample results collected during 2008 at GISP1.

A



B

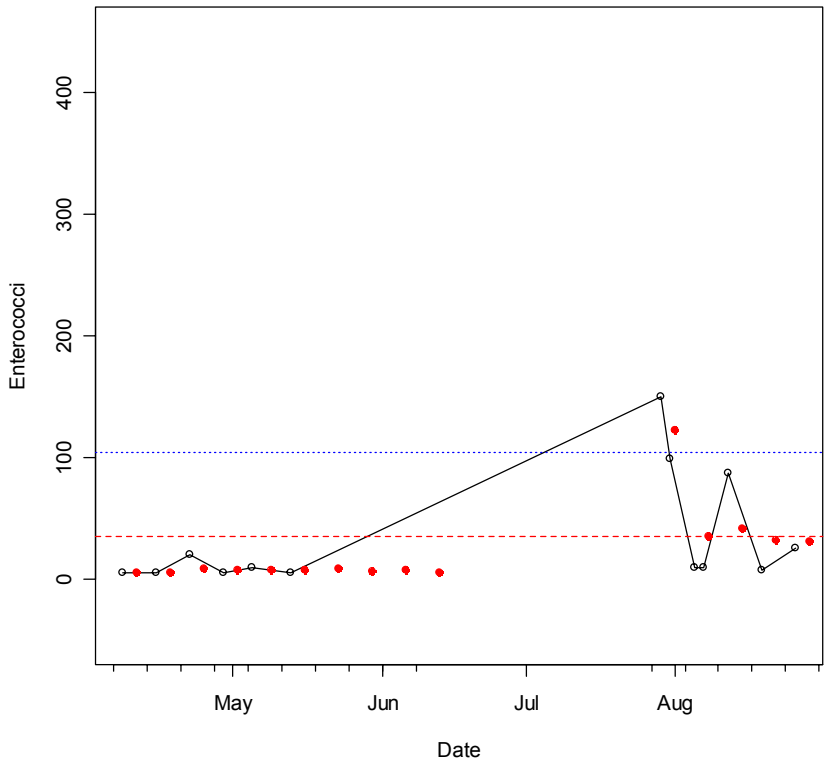
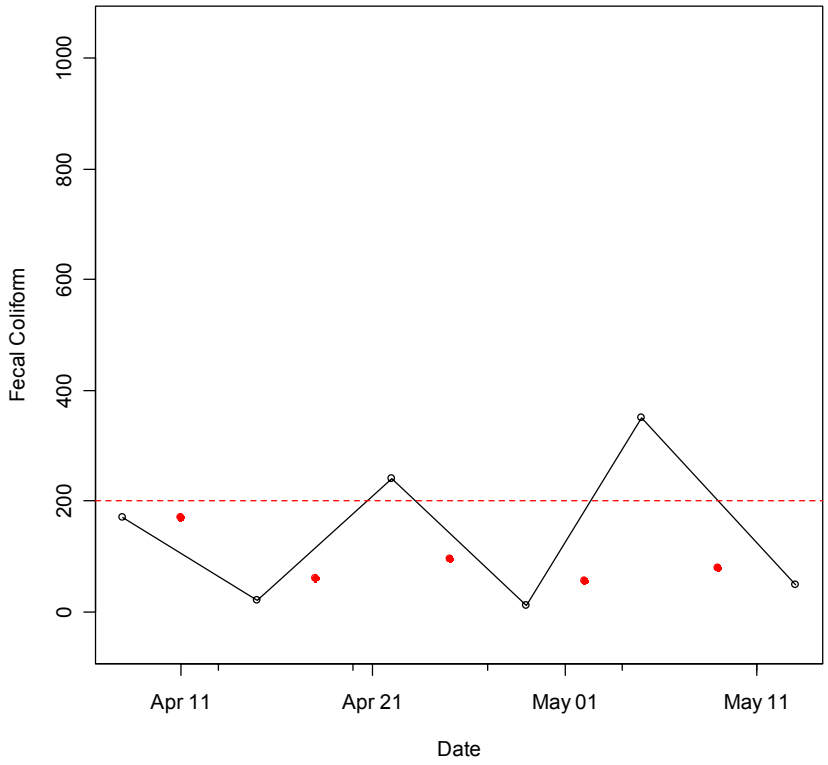


Figure B.14. Time series of sample results collected during 2008 at GISP2.

A



B

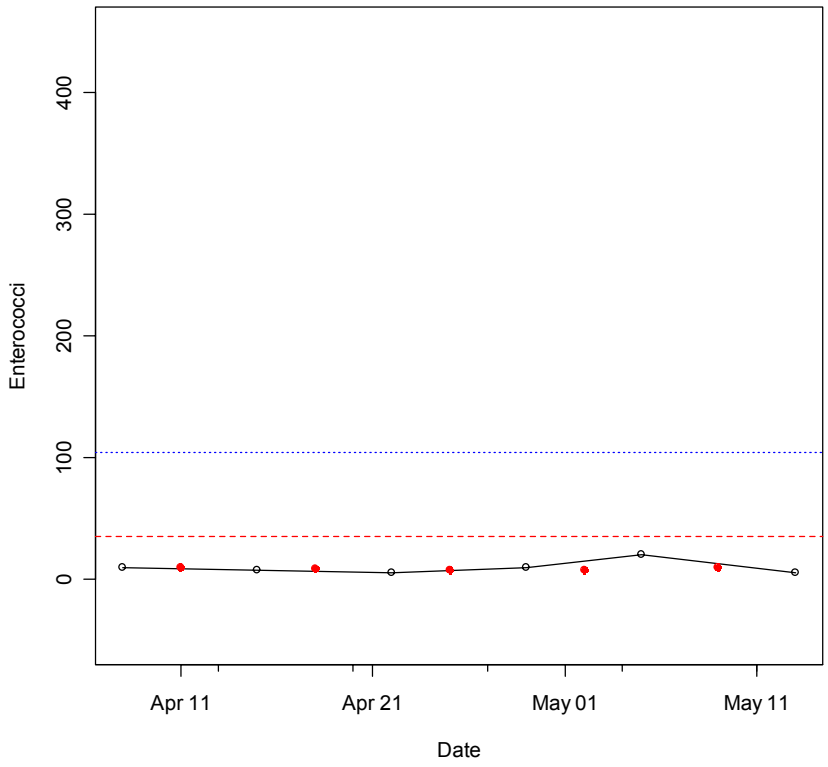
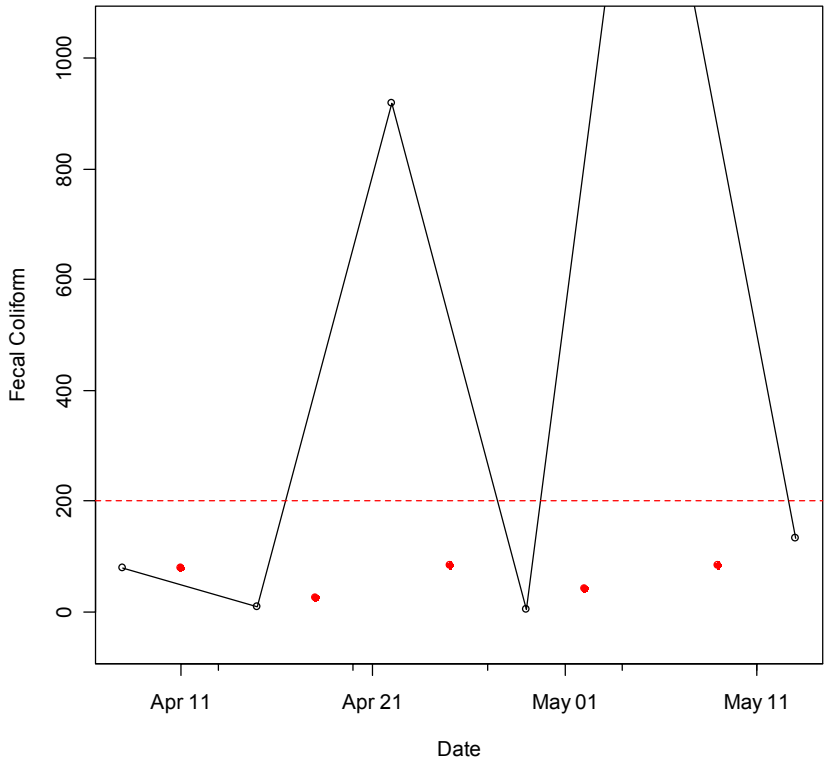


Figure B.15. Time series of sample results collected during 2008 at GISP3.

A



B

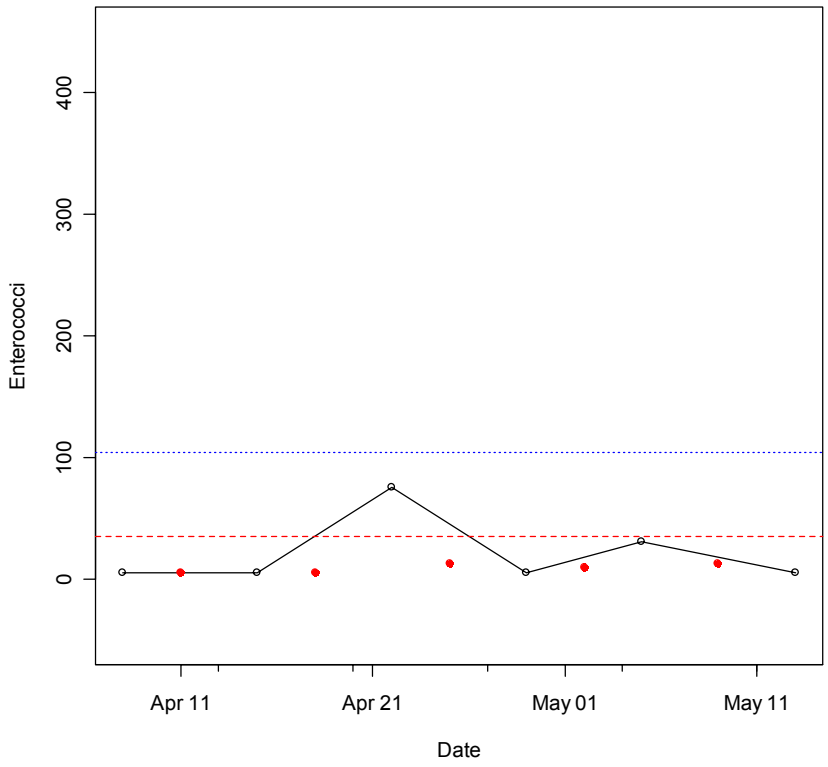
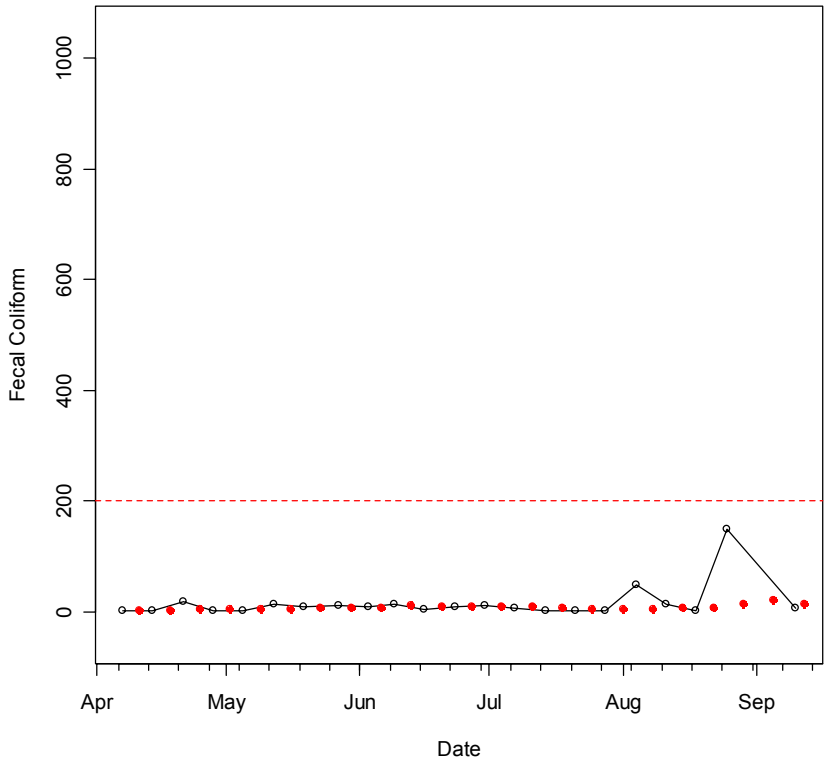


Figure B.16. Time series of sample results collected during 2008 at GISP4.

A



B

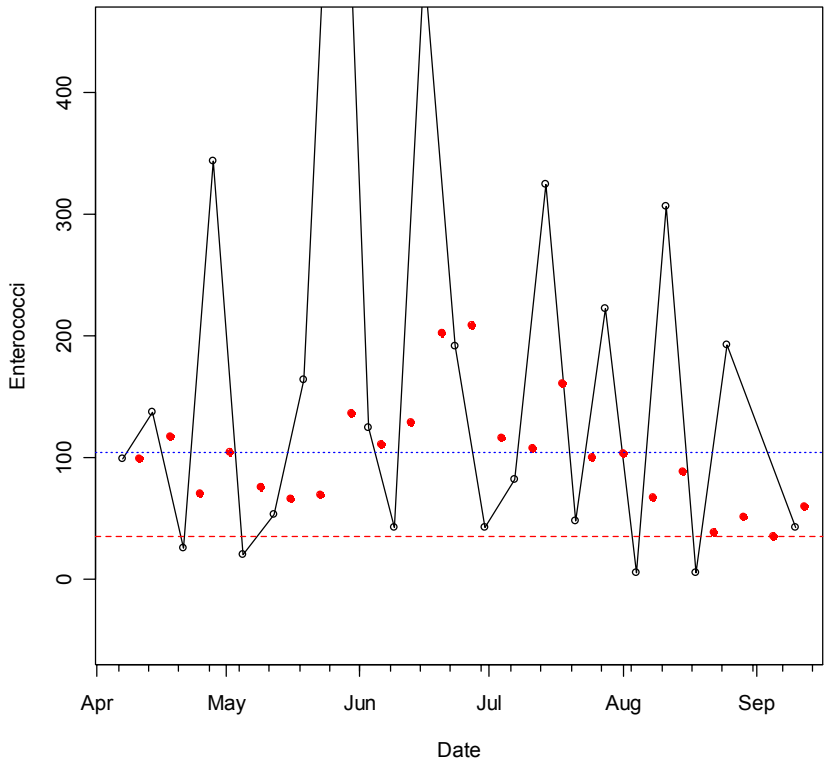
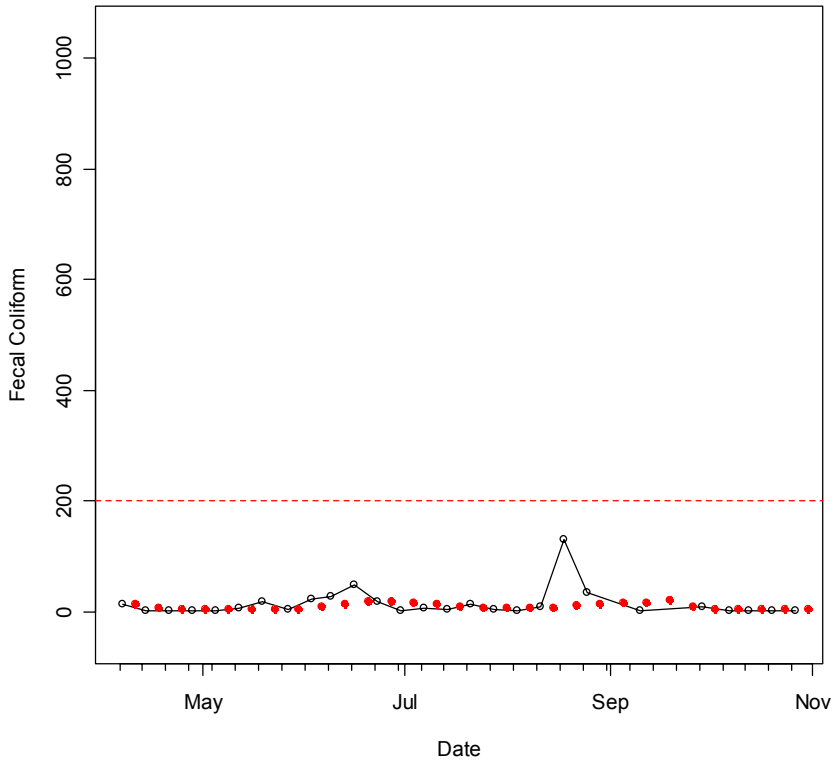


Figure B.17. Time series of sample results collected during 2008 at HACK1.

A



B

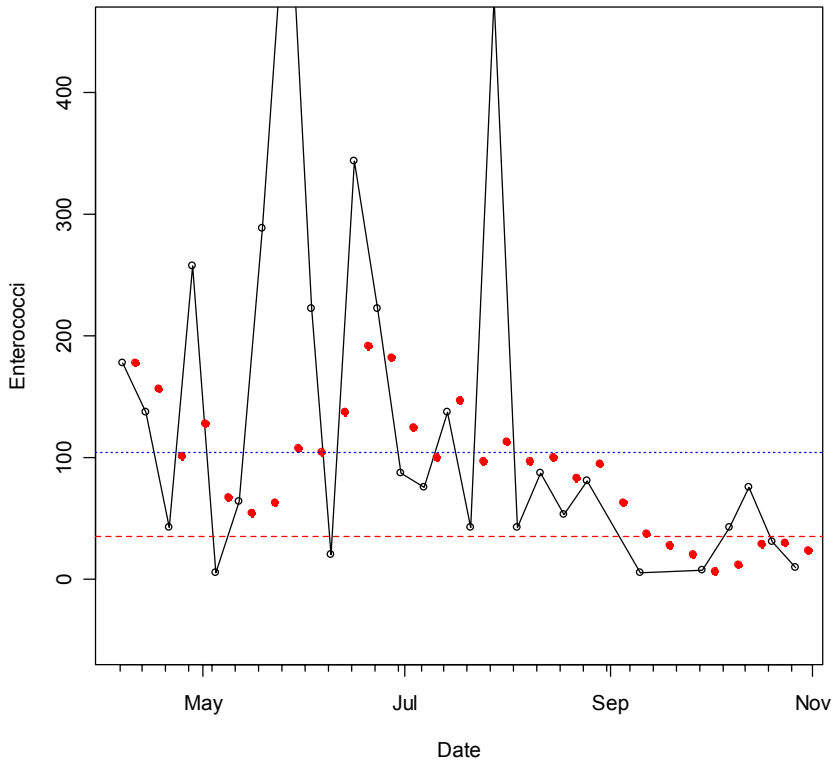
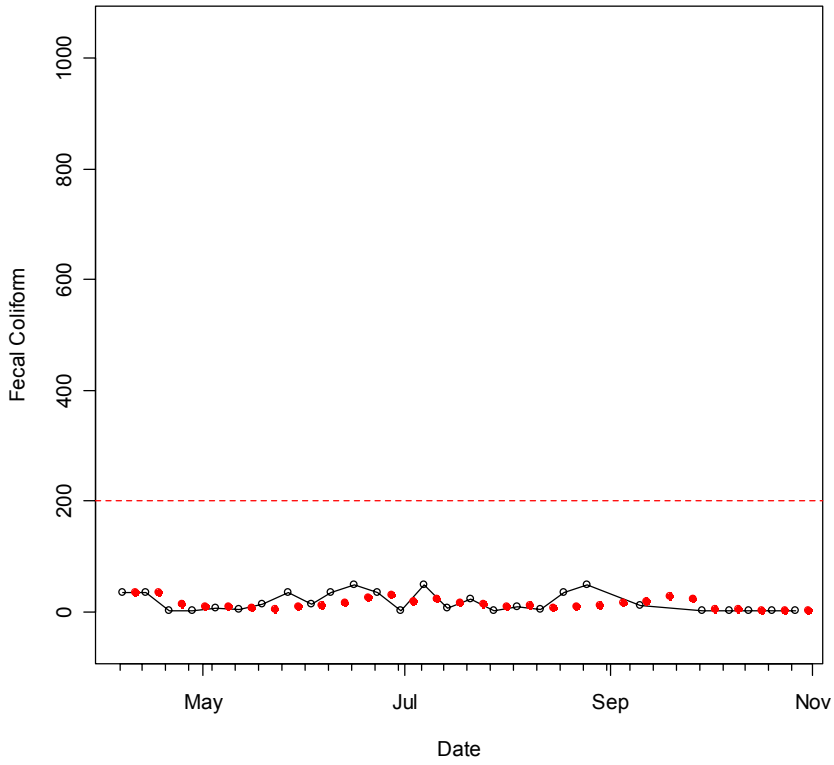


Figure B.18. Time series of sample results collected during 2008 at HOLLY1.

A



B

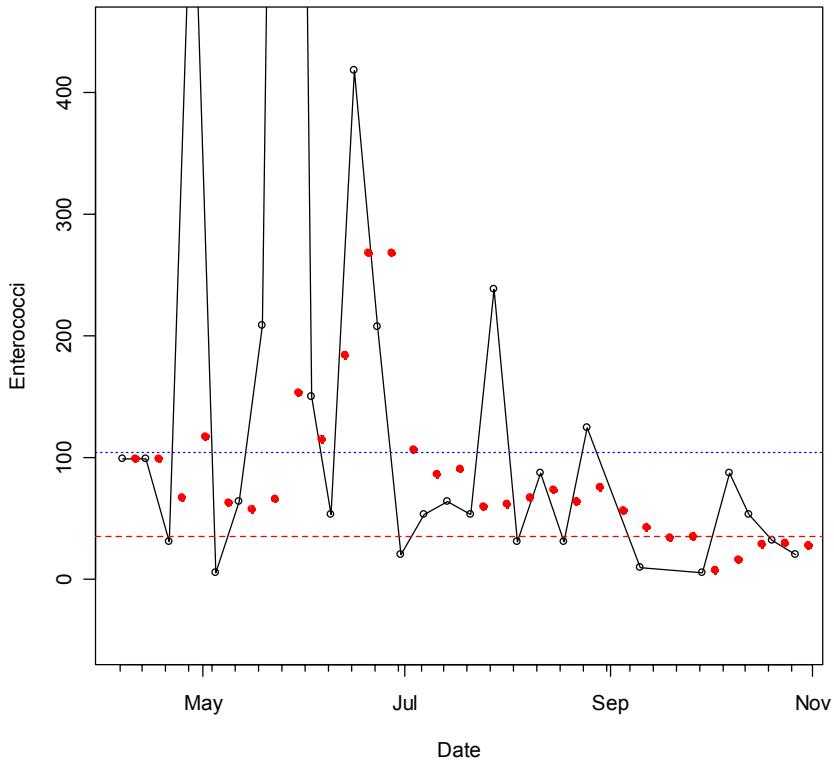
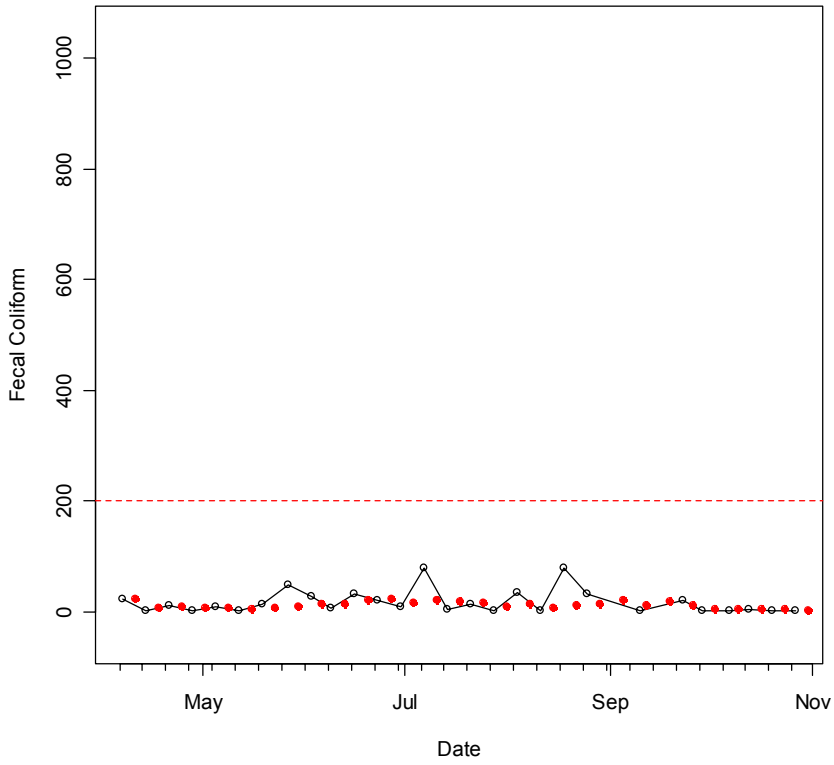


Figure B.19. Time series of sample results collected during 2008 at HOLLY2.

A



B

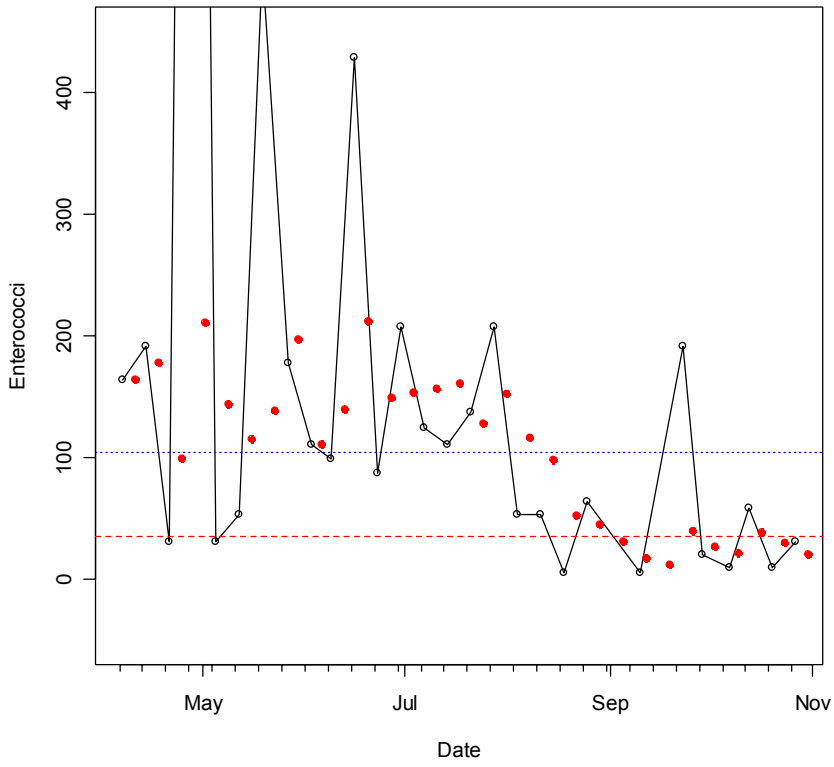
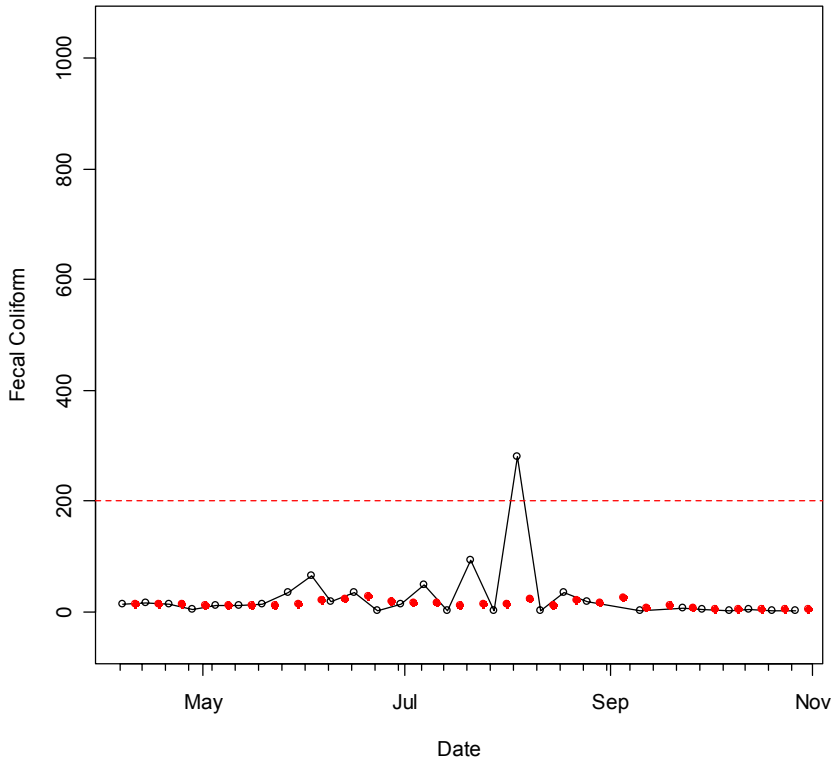


Figure B.20. Time series of sample results collected during 2008 at HOLLY3.

A



B

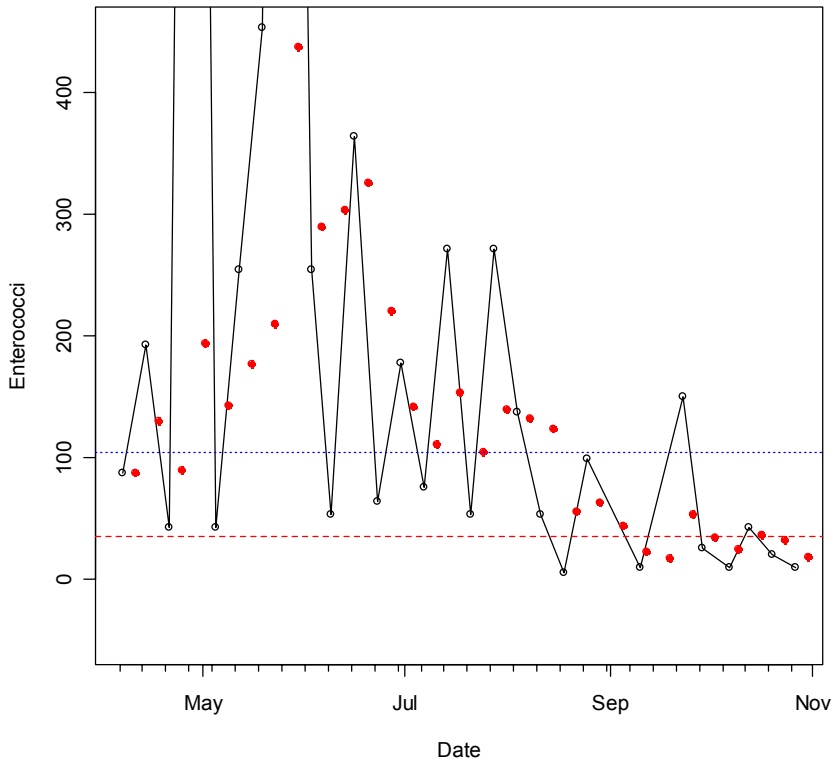
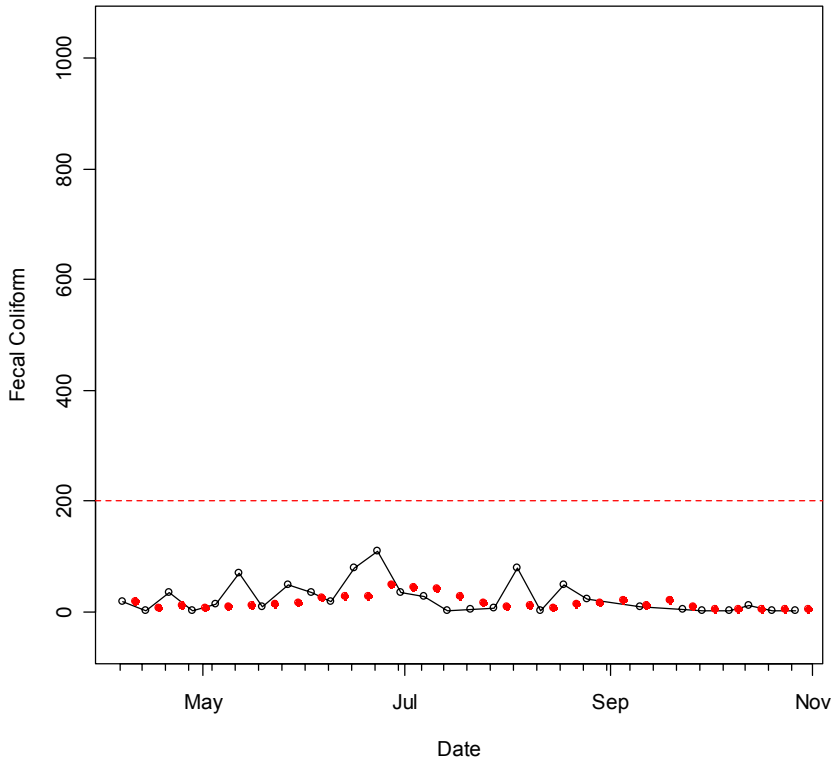


Figure B.21. Time series of sample results collected during 2008 at HOLLY4.

A



B

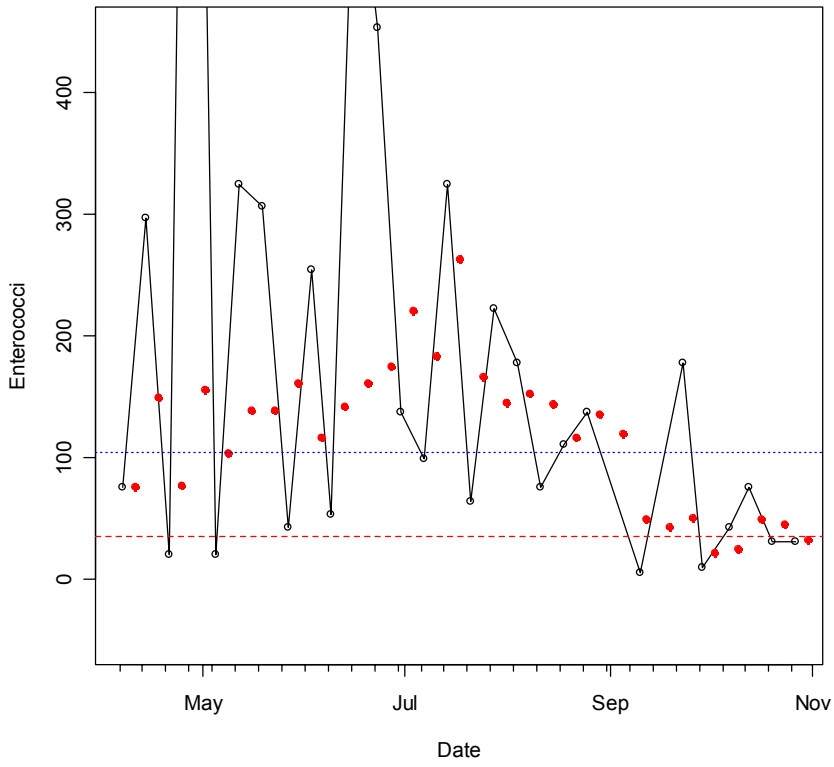
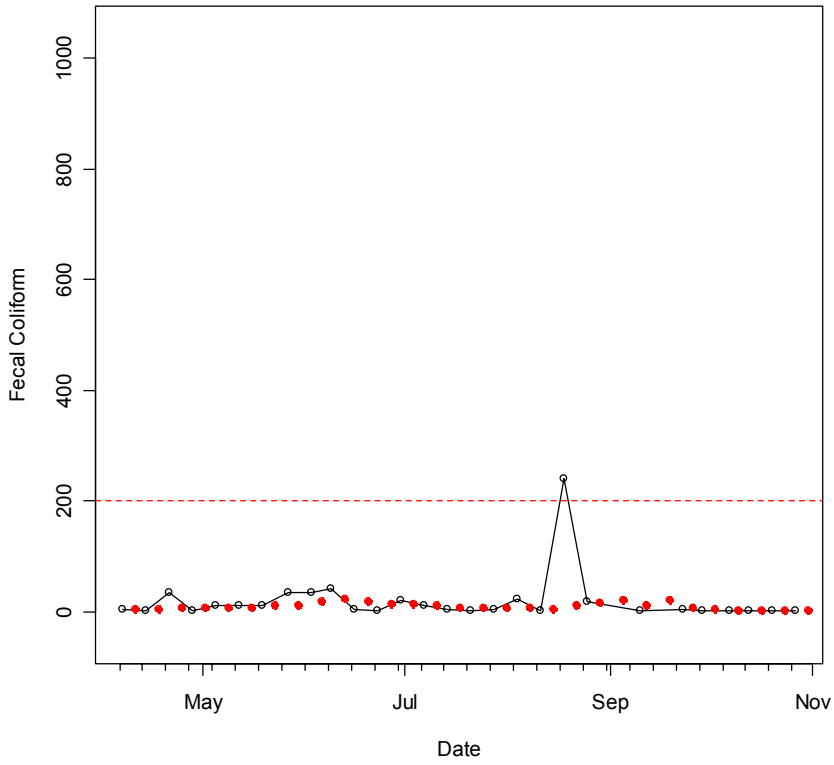


Figure B.22. Time series of sample results collected during 2008 at HOLLY5.

A



B

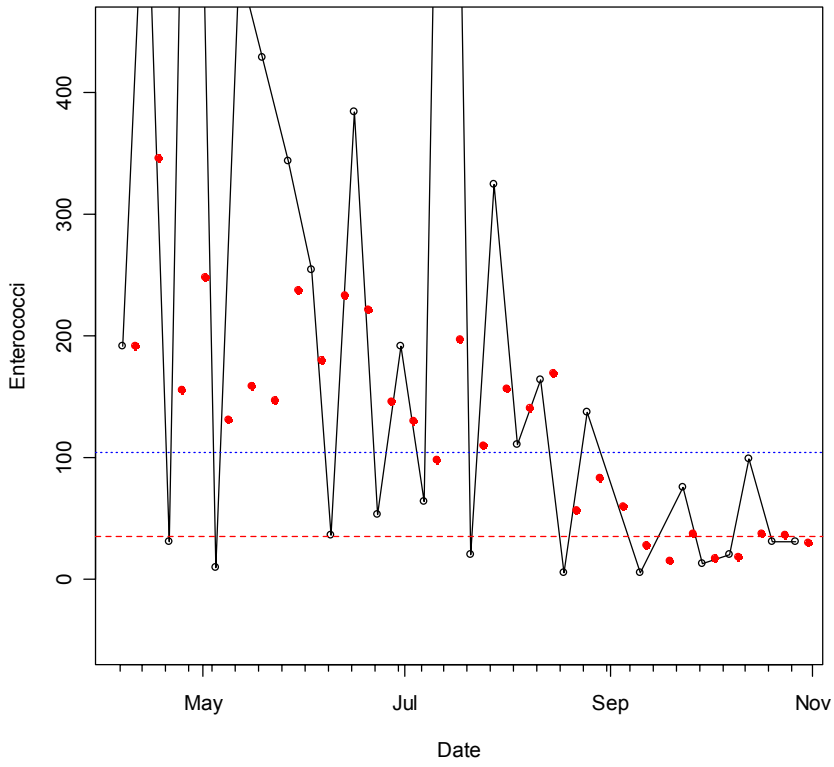
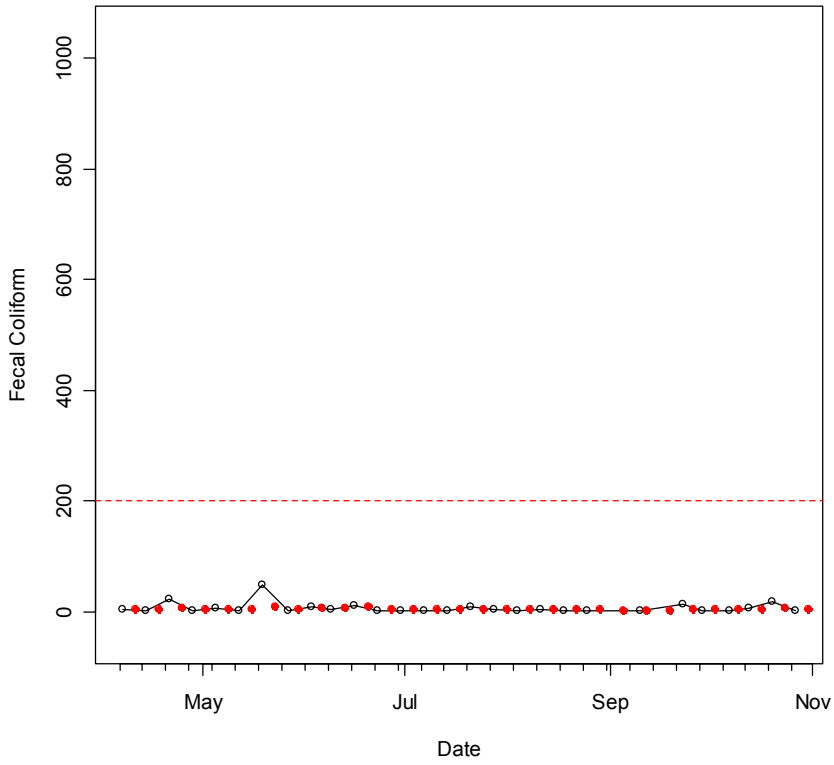


Figure B.23. Time series of sample results collected during 2008 at HOLLY6.

A



B

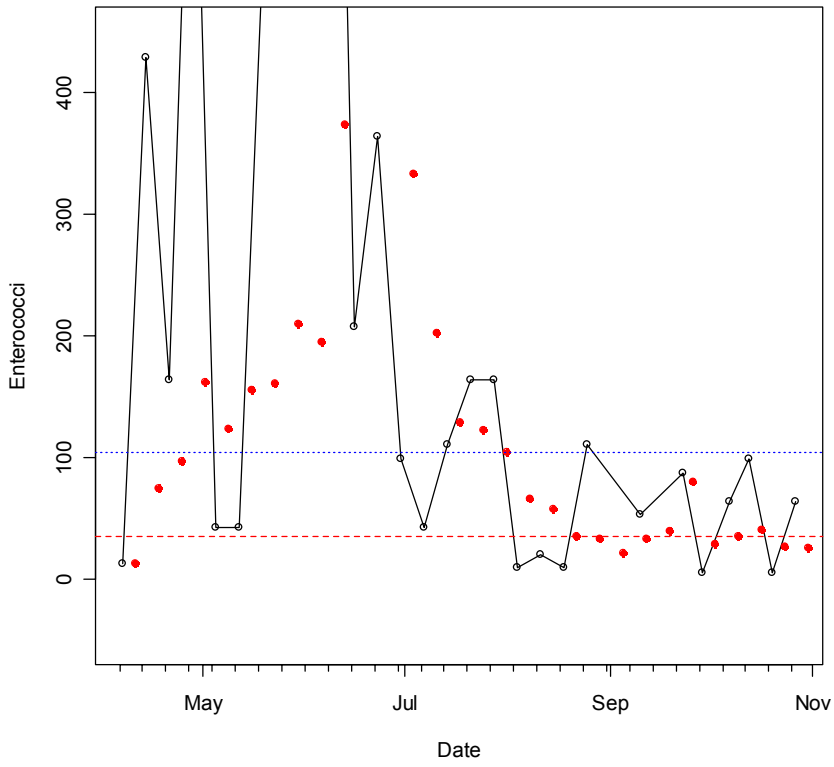
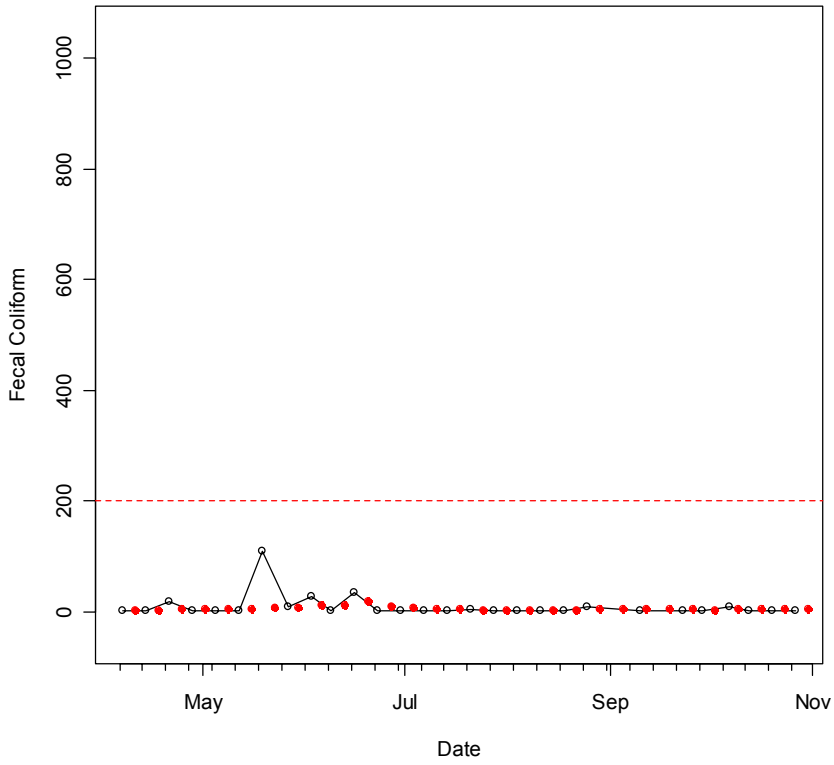


Figure B.24. Time series of sample results collected during 2008 at LTFL1.

A



B

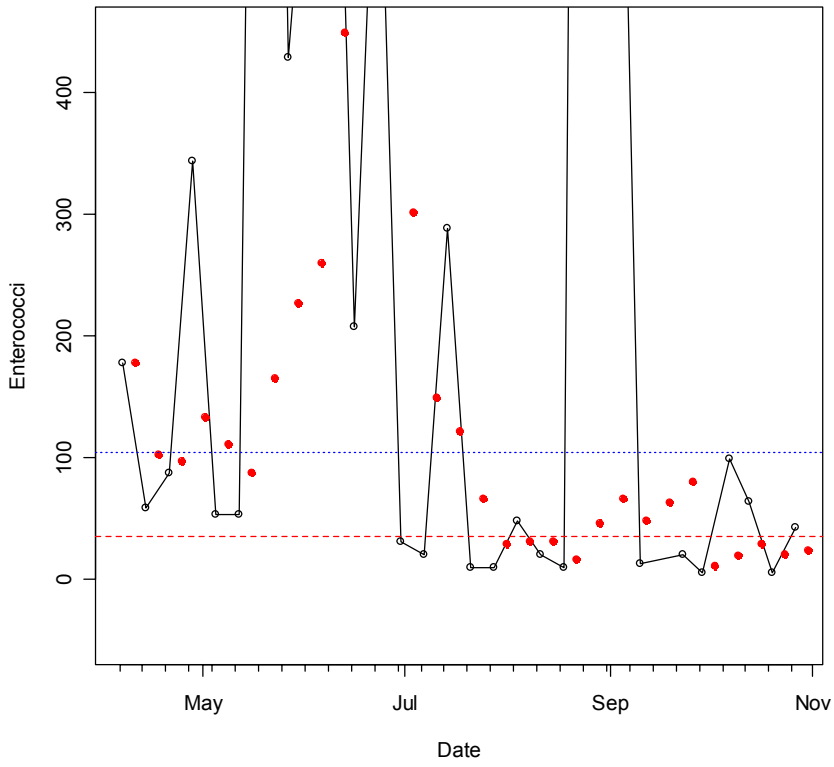
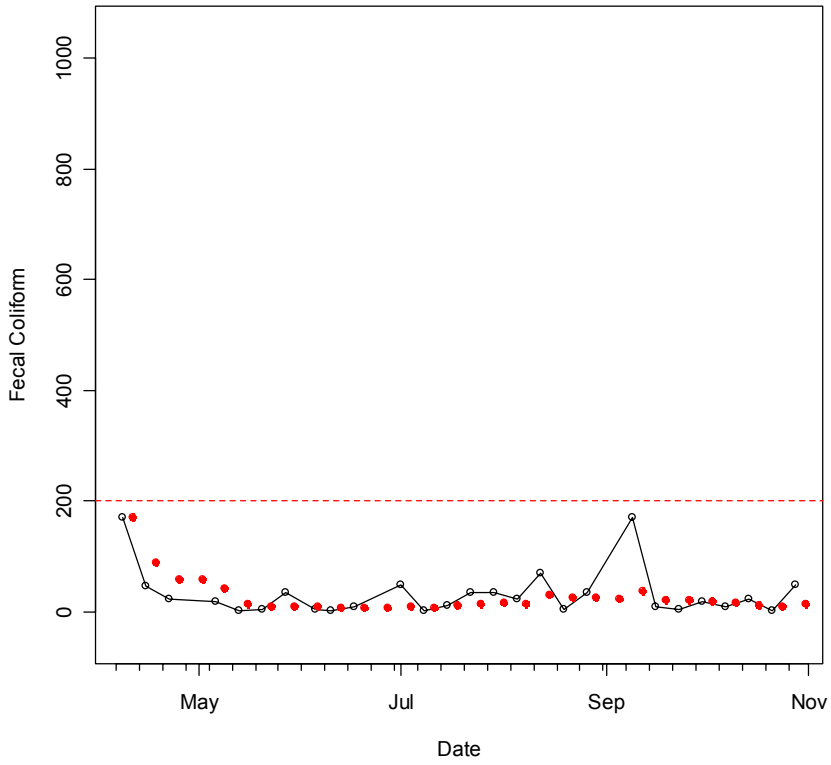


Figure B.25. Time series of sample results collected during 2008 at MART1.

A



B

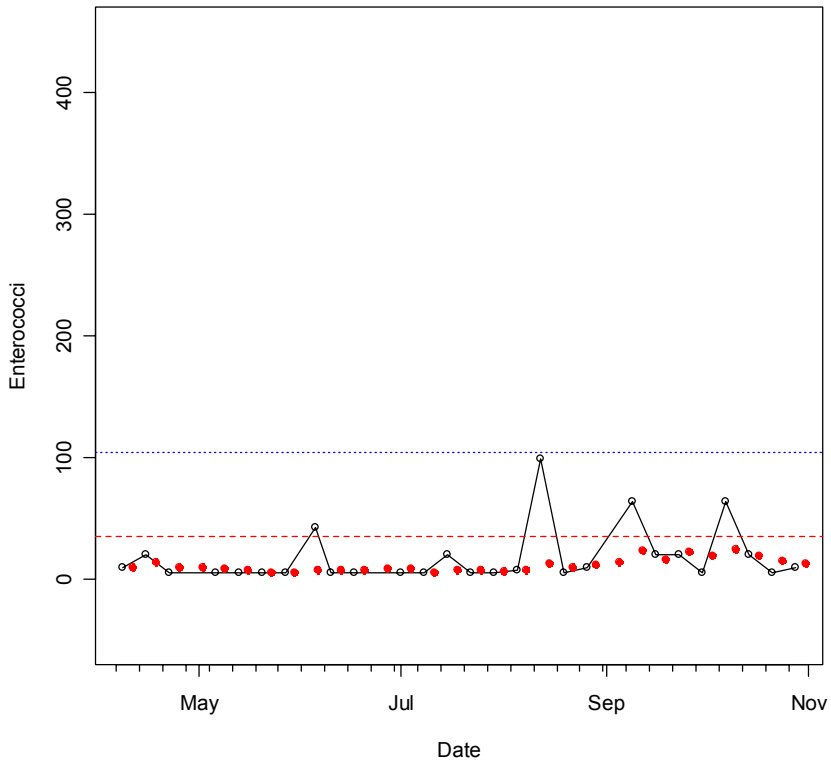
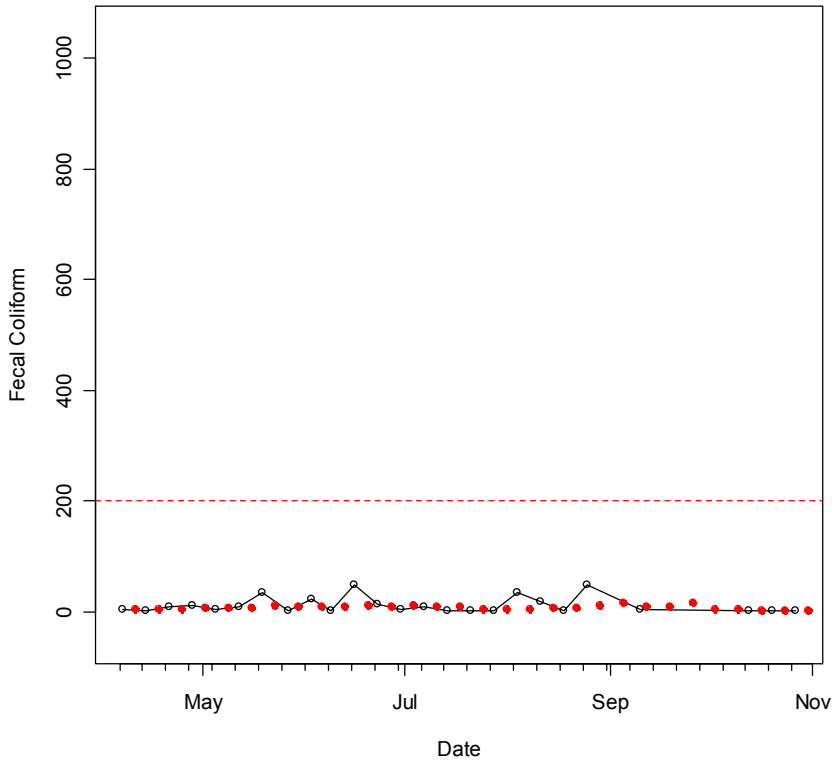


Figure B.26. Time series of sample results collected during 2008 at PONT1.

A



B

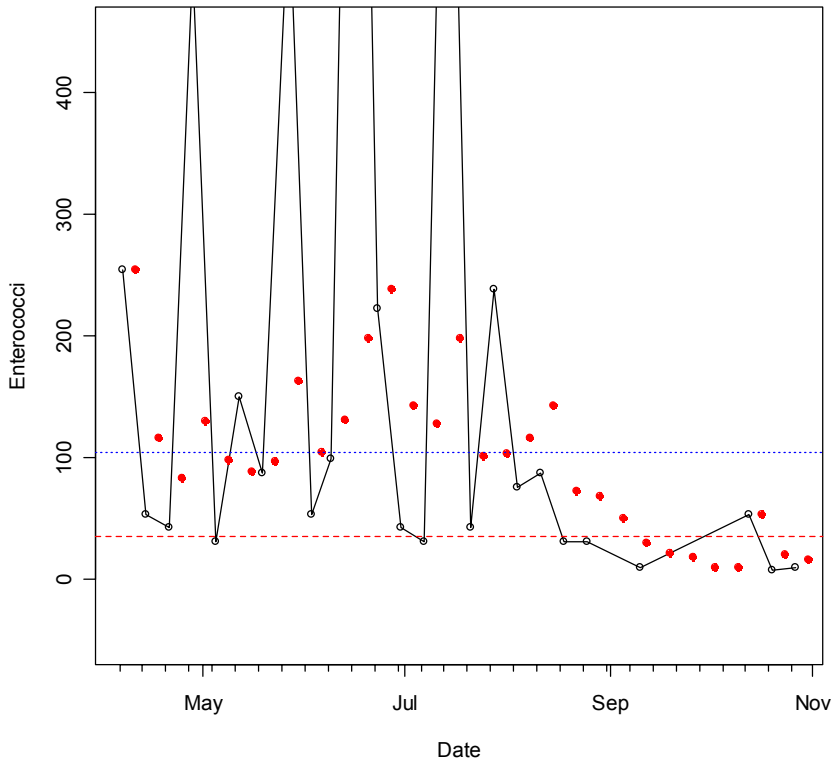


Figure B.27. Time series of sample results collected during 2008 at RUTH1.

APPENDIX C

Sample Results

2008 Beach Sample Results

Constance Beach

CNST1 ***Beach Name*** *Constance Beach*

Beach Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	71	2	1091	15.8	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	68	2	288	24.9	Routine
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	110	42	16.8	Routine
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	1652	22.8	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	2	87	13.7	Routine
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	2	53	22.4	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	17	178	15.9	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	17	87	19.3	Routine
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	82	33	591	8.0	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	2	478	5.7	Field Split
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	7.8	560	5.7	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	79	324	10.1	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	49	406	10.0	Field Duplicate
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	2	406	16.8	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	1.8	111	19.8	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	2	75	17.1	Routine
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	4.5	192	21.3	Routine
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	4.5	53	24.1	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	2	531	24.0	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	7.8	53	33.4	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	2	31	30.3	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	2	5	31.7	Routine
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	6.8	20	35.0	Routine
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	4	20	35.0	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	2	53	25.3	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	4.5	31	21.5	Routine
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	20	28.5	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	10	29.8	Field Split
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	99	29.9	Routine
	10/20/20	10:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	10	21.7	Routine
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	66	2	64	31.5	Routine
Cypremort Point State Park											
CYPT1			***Beach Name*** *Cypremort Point State Park*								
	4/7/2008	7:05	High Tide	Fog	South	Light (0-5 mph)	72	23	5	1.4	Routine
	4/15/200	7:15	Low Tide	Clear	North	Light (0-5 mph)		21	5	0.9	Routine
	4/15/200	7:15	Low Tide	Clear	North	Light (0-5 mph)		14	5	0.9	Field Split
	4/21/200	7:15	High Tide	Clear	East	Light (0-5 mph)	68	2	5	1.2	Routine
	4/28/200	7:20	Low Tide Falling	Scattered	North	Moderate-Light (5-10 mph)	69	79	453	0.4	Routine
	5/5/2008	6:30	High Tide	Partly Cloudy	East-Southeast	Light (0-5 mph)	72	13	20	1.0	Routine
	5/12/200	7:10	Low Tide Falling	Clear	North-Northeast	Light (0-5 mph)	70	79	20	0.8	Routine
	5/19/200	7:10	High Tide	Clear	West	Moderate-Light (5-10 mph)	73	21	192	1.1	Field Duplicate
	5/19/200	7:10	High Tide	Clear	West	Moderate-Light (5-10 mph)	73	79	192	0.4	Routine
	5/27/200	7:12	High Tide	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	80	11	1184	1.1	Routine
	6/2/2008	7:10	High Tide	Scattered	Southeast	Moderate (10-15 mph)	83	49	64	0.8	Routine
	6/9/2008	7:13	Low Tide Falling	Scattered	South	Moderate-Light (5-10 mph)	83	13	254	0.9	Routine
	6/16/200	7:12	High Tide	Scattered	South-Southeas	Light (0-5 mph)	83	7.8	20	0.9	Routine
	6/23/200	7:15	Low Tide Falling	Clear	Northeast	Light (0-5 mph)	83	70	150	1.2	Routine
	6/30/200	7:10	High Tide Falling	Cloudy	East	Moderate-Light (5-10 mph)	82	49	137	1.1	Routine
	7/7/2008	7:10	Low Tide Falling	Scattered	East	Light (0-5 mph)	81	2	87	1.2	Routine
	7/14/200	7:13	High Tide	Partly Cloudy	West	Moderate-Light (5-10 mph)	82	4.5	42	0.7	Routine
	7/21/200	7:08	High Tide	Clear	North	Light (0-5 mph)	83	7.8	99	0.9	Routine
	7/28/200	7:09	High Tide	Partly Cloudy	West-Northwest	Moderate (10-15 mph)	83	31	306	0.9	Routine
	8/4/2008	7:12	High Tide Rising	Partly Cloudy	Northeast	Moderate (10-15 mph)	82	2	238	4.1	Routine
	8/11/200	7:07	High Tide	Cloudy	South	Moderate-Strong (15-20	84	110	137	2.2	Routine
	8/18/200	7:05	High Tide Falling	Scattered	North-Northeast	Light (0-5 mph)	83	13	137	3.0	Routine
	8/25/200	7:12	High Tide Falling	Partly Cloudy	South	Moderate-Strong (15-20	81	22	75	3.1	Routine
	9/9/2008	7:16	High Tide	Clear	Calm	Calm (0 mph)	80	6.8	31	13.8	Routine
	9/22/200	7:40	High Tide Falling	Clear	Northeast	Moderate (10-15 mph)	79	23	53	7.0	Routine
	9/29/200	7:25	High Tide Falling	Scattered	North	Moderate-Light (5-10 mph)	76	22	111	6.9	Routine
	10/6/200	7:15	High Tide	Scattered	North	Moderate-Light (5-10 mph)	79	17	406	5.0	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/13/20	7:18	High Tide Falling	Partly Cloudy	Northeast	Moderate-Light (5-10 mph)	74	2	207	6.6	Routine
	10/20/20	7:15	High Tide Falling	Clear	North	Light (0-5 mph)	72	2	31	5.2	Routine
	10/27/20	7:18	Low Tide	Clear	North	Moderate-Strong (15-20	67	49	344	6.4	Routine
Long Beach											
DUNG1			***Beach Name*** *Long Beach*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	71	2	831	13.3	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	68	2	53	24.9	Routine
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	11	75	17.0	Routine
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	831	21.3	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	4.5	178	13.7	Routine
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	6.8	53	22.5	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	33	306	15.7	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	7.8	111	19.6	Routine
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	17	306	9.5	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	2	2005	5.8	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	4.5	1652	5.8	Field Duplicate
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	6.8	885	10.6	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	6.1	782	18.9	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	2	99	20.3	Routine
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	2	42	16.1	Routine
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	364	22.8	Field Split
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	164	23.2	Routine
	7/21/200	8:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	2	222	24.0	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	2	164	24.3	Routine
	8/4/2008	8:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	4.5	10	32.9	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	23	64	31.1	Routine
	8/18/200	8:25	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	2	10	32.6	Routine
	8/25/200	8:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	4.5	75	35.0	Routine
	9/10/200	8:15	High Tide	Scattered	Northeast	Moderate-Light (5-10 mph)	88	2	20	35.0	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	7.8	31	26.5	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	10	28.5	Routine
	10/7/200	9:30	Normal	Cloudy	Southeast	Moderate (10-15 mph)	78	4.5	87	28.4	Field Duplicate
	10/7/200	9:30	Normal	Cloudy	Southeast	Moderate (10-15 mph)	78	2	20	28.2	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/13/20	9:30	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	31	29.2	Routine
	10/20/20	10:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	10	22.1	Routine
	10/27/20	10:00	Low Tide	Clear	North	Strong (20-35 mph)	66	7.8	31	35.0	Routine
Fontainebleau State Park											
FNTB1			***Beach Name*** *Fontainebleau State Park*								
	4/15/200	10:00	Low Tide Falling	Clear	Northeast	Moderate-Light (5-10 mph)	58	4.5	5	4.7	Routine
	4/22/200	9:40	High Tide Rising	Partly Cloudy	Calm		76.6	33	5	4.6	Routine
	4/29/200	10:00	Low Tide Falling	Clear	North-Northwest	Light (0-5 mph)	71.4	2	5	4.5	Routine
	5/6/2008	9:40	High Tide Rising	Partly Cloudy	East	Light (0-5 mph)	74.3	33	5	4.1	Routine
	5/13/200	10:20	Low Tide Falling	Clear	East	Moderate-Strong (15-20	75.6	21	10	3.6	Field Split
	5/13/200	10:20	Low Tide Falling	Clear	East	Moderate-Strong (15-20	75.6	33	5	3.6	Routine
	5/20/200	10:20	Low Tide Falling	Clear	South-Southwes	Moderate-Strong (15-20	78	49	5		Routine
	5/27/200	10:50	Low Tide Falling	Clear	East-Northeast	Moderate-Light (5-10 mph)	81	23	75	2.2	Routine
	6/5/2008	7:35	Low Tide Falling	Clear	South	Light (0-5 mph)	81	23	75	1.6	Routine
	6/10/200	9:30	Extremely High	Clear	Calm	Calm (0 mph)	85	2	5	1.7	Routine
	6/17/200	9:40	High Tide Rising	Clear	North-Northwest	Light (0-5 mph)	84	110	42	2.0	Routine
	6/24/200	9:15	Low Tide	Clear	Calm	Calm (0 mph)	85	4.5	5	1.0	Routine
	6/24/200	9:15	Low Tide	Clear	Calm	Calm (0 mph)	85	17	10	1.0	Field Duplicate
	7/1/2008	9:20	Low Tide Falling	Clear	Northeast	Light (0-5 mph)	83	6.1	5	1.3	Routine
	7/8/2008	9:00	Low Tide	Clear	East	Light (0-5 mph)	85	220	137	1.3	Routine
	7/15/200	9:30	Extremely Low	Clear	East	Light (0-5 mph)	81	540	207	1.2	Routine
	7/22/200	9:30	Low Tide	Partly Cloudy	East-Southeast	Light (0-5 mph)	84	350	591	1.5	Routine
	7/29/200	11:10	Low Tide Falling	Rain	Southwest	Calm (0 mph)	84	33	31	1.4	Routine
	8/5/2008	9:45	Low Tide Falling	Scattered	East-Southeast	Moderate (10-15 mph)	82	23	31	1.3	Field Duplicate
	8/5/2008	9:45	Low Tide Falling	Scattered	East-Southeast	Moderate (10-15 mph)	82	350	271	1.3	Routine
	8/11/200	9:15	Low Tide Falling	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	82	70	64	2.3	Routine
	8/19/200	9:30	Low Tide Falling	Cloudy	East-Southeast	Calm (0 mph)	84	49	20	2.5	Routine
	8/26/200	9:40	Low Tide Falling	Scattered	West	Light (0-5 mph)	78	46	31	1.4	Routine
	9/9/2008	10:50	Normal	Scattered	East	Light (0-5 mph)	85	17	10	6.9	Routine
	9/16/200	9:45	Normal	Cloudy	North	Light (0-5 mph)	79	33	20	12.5	Routine
	9/23/200	10:10	Low Tide Falling	Clear	Northeast	Moderate-Light (5-10 mph)	77	33	5	8.4	Routine
	9/23/200	10:10	Low Tide Falling	Clear	Northeast	Moderate-Light (5-10 mph)	77	23	5	8.4	Field Duplicate
	9/30/200	10:00	Low Tide	Clear	North	Moderate-Light (5-10 mph)	79	4.5	10	7.0	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	10/7/200	9:30	High Tide Rising	Scattered	Southwest	Light (0-5 mph)	80	33	111	4.9	Routine
	10/14/20	9:38	Low Tide Falling	Partly Cloudy	Northeast	Light (0-5 mph)	76	23	53	5.1	Routine
	10/21/20	10:10	Low Tide Falling		East	Light (0-5 mph)	71	2	5	5.9	Routine
	10/28/20	9:50	High Tide Falling		East	Moderate-Light (5-10 mph)	57	33	42	5.7	Routine
Fourchon											
FOUR1	***Beach Name*** *Fourchon - 1*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	71.6	6.8	10	13.3	Field Split
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	71.6	2	20	13.3	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	2	5	25.7	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	2	5	19.0	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	69	2	10	16.8	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	75	23	5	5.0	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75.2	2	5	17.8	Routine
	5/20/200	6:17	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	74	7.8	10		Routine
	5/27/200	6:26	High Tide Rising	Scattered	Southeast	Moderate-Light (5-10 mph)	82	4.5	10	10.9	Routine
	6/3/2008	6:52	High Tide Rising	Scattered	South	Moderate-Light (5-10 mph)	81	33	31	22.0	Routine
	6/9/2008	6:10	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	83	2	5	16.4	Routine
	6/17/200	6:43	High Tide Rising	Scattered	South	Light (0-5 mph)	82	20	10	33.6	Routine
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	82	2	5	31.9	Routine
	7/1/2008	6:42	Extremely High	Cloudy	Calm	Calm (0 mph)	84	7.8	10	25.9	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	86	7.8	5	11.6	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	86	7.8	10	11.6	Field Split
	7/15/200	6:40	High Tide Rising	Partly Cloudy	North	Light (0-5 mph)	81	13	446	35.0	Routine
	7/22/200	7:30	High Tide Rising	Partly Cloudy	West	Moderate-Strong (15-20	83	79	124	21.7	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	33	64	31.0	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	4.5	5	27.3	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	140	831	33.7	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	80	540	945	31.4	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	13	20	35.0	Field Split
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	49	99	35.0	Routine
Fourchon											
FOUR2	***Beach Name*** *Fourchon - 2*										

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	71.6	11	5	13.5	Routine
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	71.6	2	5	13.5	Field Split
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	4	5	28.6	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	4.5	5	19.1	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	69	2	10	17.1	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	75	7.8	10	10.0	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75.2	13	10	17.8	Routine
	5/20/200	6:17	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	74	2	5		Routine
	5/27/200	6:26	High Tide Rising	Scattered	Southeast	Moderate-Light (5-10 mph)	82	4.5	5	11.4	Routine
	6/3/2008	6:52	High Tide Rising	Scattered	South	Moderate-Light (5-10 mph)	81	33	42	22.0	Routine
	6/9/2008	6:10	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	83	2	10	18.1	Routine
	6/17/200	6:43	High Tide Rising	Scattered	South	Light (0-5 mph)	82	20	5	33.8	Routine
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	82	33	10	32.4	Routine
	7/1/2008	6:42	Extremely High	Cloudy	Calm	Calm (0 mph)	84	33	10	25.6	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	86	4.5	5	11.6	Routine
	7/15/200	6:40	High Tide Rising	Partly Cloudy	North	Light (0-5 mph)	81	9.3	10	35.0	Routine
	7/22/200	7:30	High Tide Rising	Partly Cloudy	West	Moderate-Strong (15-20	83	23	42	21.7	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	33	10	31.5	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	20	5	27.1	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	70	591	33.6	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	80	350	406	31.3	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	6.8	31	35.0	Routine
Fourchon											
FOUR3	***Beach Name*** *Fourchon - 3*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	71.6	2	5	13.5	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	2	5	28.5	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	2	5	19.3	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	69	2	5	17.0	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	75	2	5	11.6	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75.2	2	5	18.0	Routine
	5/20/200	6:17	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	74	2	5		Routine
	5/27/200	6:26	High Tide Rising	Scattered	Southeast	Moderate-Light (5-10 mph)	82	2	5	11.3	Routine
	6/3/2008	6:52	High Tide Rising	Scattered	South	Moderate-Light (5-10 mph)	81	7.8	20	22.1	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	6/9/2008	6:10	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	83	2	10	17.6	Routine
	6/17/200	6:43	High Tide Rising	Scattered	South	Light (0-5 mph)	82	2	20	33.8	Routine
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	82	4	5	32.5	Field Duplicate
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	82	2	5	32.5	Routine
	7/1/2008	6:42	Extremely High	Cloudy	Calm	Calm (0 mph)	84	33	64	26.0	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	86	13	10	11.8	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	86	14	10	11.7	Field Split
	7/15/200	6:40	High Tide Rising	Partly Cloudy	North	Light (0-5 mph)	81	170	5	35.0	Routine
	7/22/200	7:30	High Tide Rising	Partly Cloudy	West	Moderate-Strong (15-20	83	49	591	21.8	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	46	20	31.7	Field Split
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	17	20	31.8	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	4.5	5	27.1	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	33	150	33.6	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	80	170	150	31.2	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	13	10	35.0	Routine
Fourchon											
FOUR4	***Beach Name*** *Fourchon - 4*										
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	2	5	28.2	Routine
	5/20/200	6:17	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	74	2	10		Routine
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	82	2	10	31.0	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	86	23	5	12.0	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	4.5	5	27.0	Routine
Grand Isle Beach											
GIB1	***Beach Name*** *Grand Isle Beach - 1*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	71.6	6.8	10	11.3	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	60	2	5	23.6	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	33	5	16.2	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	70	2	5	12.7	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	75	7.8	5	9.3	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75	33	5	14.2	Routine
	5/20/200	6:17	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	74	6.8	20		Routine
	5/27/200	6:26	High Tide Rising	Scattered	Southeast	Moderate-Light (5-10 mph)	82	6.8	5	9.8	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	6/3/2008	6:52	High Tide Rising	Scattered	South	Moderate-Light (5-10 mph)	82	4.5	5	16.8	Routine
	6/9/2008	6:10	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	84	4	5	12.2	Routine
	6/17/200	6:43	High Tide Rising	Scattered	South	Light (0-5 mph)	83	4.5	5	20.6	Routine
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	83	2	5	20.5	Routine
	7/1/2008	6:42	Extremely High	Cloudy	Calm	Calm (0 mph)	84	2	5	17.2	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	87	2	5	8.2	Routine
	7/15/200	6:40	High Tide Rising	Partly Cloudy	North	Light (0-5 mph)	81	20	10	28.1	Routine
	7/22/200	7:30	High Tide Rising	Partly Cloudy	West	Moderate-Strong (15-20	83	49	254	20.6	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	23	178	25.5	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	70	31	24.6	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	22	53	33.1	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	82	79	20	30.4	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	2	20	35.0	Routine
	9/10/200	7:10	Extremely High	Scattered	Northeast	Moderate-Strong (15-20	84	23	364	23.8	Routine
	9/17/200	7:02	Low Tide	Scattered	East	Moderate-Light (5-10 mph)	75	13	10	22.3	Routine
	10/1/200	8:02	Low Tide	Clear	North	Moderate-Light (5-10 mph)	76	49	5	25.9	Routine
	10/7/200	8:49	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	80	7.8	10	20.5	Routine
	10/14/20	7:12	High Tide Falling	Scattered	East	Moderate (10-15 mph)	78	23	10	25.7	Routine
	10/20/20	7:05	Low Tide	Clear	Northeast	Light (0-5 mph)	69	2	5	24.9	Routine
	10/28/20	7:25	Extremely Low	Clear	North	Moderate-Strong (15-20	45	2	5	29.3	Routine
Grand Isle Beach											
GIB2	***Beach Name*** *Grand Isle Beach - 2*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	72.5	4.5	5	11.3	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	60	2	5	27.0	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	49	5	16.6	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	70	2	5	13.4	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	75	17	5	9.6	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75	6.8	5	14.2	Routine
	5/20/200	6:17	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	74	2	5		Routine
	5/27/200	6:26	High Tide Rising	Scattered	Southeast	Moderate-Light (5-10 mph)	82	2	5	10.1	Routine
	6/3/2008	6:52	High Tide Rising	Scattered	South	Moderate-Light (5-10 mph)	82	13	20	17.5	Routine
	6/9/2008	6:10	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	84	2	20	10.0	Routine
	6/17/200	6:43	High Tide Rising	Scattered	South	Light (0-5 mph)	83	2	5	20.5	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	83	2	5	21.9	Routine
	7/1/2008	6:42	Extremely High	Cloudy	Calm	Calm (0 mph)	84	4.5	5	17.9	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	87	11	10	8.8	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	87	6.8	5	8.8	Field Duplicate
	7/15/200	6:40	High Tide Rising	Partly Cloudy	North	Light (0-5 mph)	81	2	5	28.6	Routine
	7/22/200	7:30	High Tide Rising	Partly Cloudy	West	Moderate-Strong (15-20	83	33	87	20.8	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	79	53	26.1	Field Split
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	23	20	26.2	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	79	42	25.5	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	2	10	32.7	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	82	2	31	30.5	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	2	5	35.0	Field Split
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	2	42	35.0	Routine
	9/10/200	7:10	Extremely High	Scattered	Northeast	Moderate-Strong (15-20	84	130	697	22.9	Routine
	9/17/200	7:02	Low Tide	Scattered	East	Moderate-Light (5-10 mph)	75	4	10	21.6	Routine
	10/1/200	8:02	Low Tide	Clear	North	Moderate-Light (5-10 mph)	76	2	5	26.1	Routine
	10/7/200	8:49	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	80	2	10	21.4	Routine
	10/14/20	7:12	High Tide Falling	Scattered	East	Moderate (10-15 mph)	78	13	5	25.8	Routine
	10/20/20	7:05	Low Tide	Clear	Northeast	Light (0-5 mph)	69	2	10	24.9	Routine
	10/28/20	7:25	Extremely Low	Clear	North	Moderate-Strong (15-20	45	2	10	31.7	Routine
Grand Isle Beach											
GIB3	***Beach Name*** *Grand Isle Beach - 3*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	72.5	4.5	10	11.6	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	60	2	5	28.0	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	2	10	16.8	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	70	7.8	5	12.3	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	75	2	5	9.6	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75.2	2	5	15.4	Routine
	5/20/200	6:17	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	74	2	10		Routine
	5/27/200	6:26	High Tide Rising	Scattered	Southeast	Moderate-Light (5-10 mph)	82	17	5	11.4	Routine
	5/27/200	6:26	High Tide Rising	Scattered	Southeast	Moderate-Light (5-10 mph)	82	4.5	10	11.4	Field Split
	6/3/2008	6:52	High Tide Rising	Scattered	South	Moderate-Light (5-10 mph)	82	4	137	17.4	Routine
	6/9/2008	6:10	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	84	2	5	12.2	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	6/17/200	6:43	High Tide Rising	Scattered	South	Light (0-5 mph)	83	11	10	20.5	Routine
	6/24/200	6:20	Normal	Partly Cloudy	Calm	Calm (0 mph)	83	79	10	25.1	Routine
	7/1/2008	6:42	Extremely High	Cloudy	Calm	Calm (0 mph)	84	4.5	5	19.2	Routine
	7/8/2008	6:18	Normal	Partly Cloudy	South-Southeas	Moderate-Light (5-10 mph)	87	4.5	10	8.8	Routine
	7/15/200	6:40	High Tide Rising	Partly Cloudy	North	Light (0-5 mph)	81	2	31	31.8	Routine
	7/22/200	7:30	High Tide Rising	Partly Cloudy	West	Moderate-Strong (15-20	83	4.5	20	20.1	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	84	4.5	20	27.1	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	49	87	25.9	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	4.5	10	33.7	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	82	2	31	29.0	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	17	5	35.0	Routine
	9/10/200	7:10	Extremely High	Scattered	Northeast	Moderate-Strong (15-20	84	11	20	23.6	Routine
	9/17/200	7:02	Low Tide	Scattered	East	Moderate-Light (5-10 mph)	75	2	5	22.2	Routine
	10/1/200	8:02	Low Tide	Clear	North	Moderate-Light (5-10 mph)	76	2	5	24.9	Routine
	10/7/200	8:49	Normal	Partly Cloudy	Southeast	Light (0-5 mph)	80	4.5	42	22.2	Routine
	10/14/20	7:12	High Tide Falling	Scattered	East	Moderate (10-15 mph)	78	17	10	25.8	Routine
	10/20/20	7:05	Low Tide	Clear	Northeast	Light (0-5 mph)	69	2	10	25.0	Routine
	10/28/20	7:25	Extremely Low	Clear	North	Moderate-Strong (15-20	45	2	10	31.7	Routine
Grand Isle State Park											
GISP1	***Beach Name*** *Grand Isle State Park - 1*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	72.5	220	10	11.1	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	13	20	14.7	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	240	20	16.1	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	69	13	5	12.1	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	73	170	64	8.3	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75	33	5	13.6	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	85	33	64	25.4	Routine
	7/31/200	6:49	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	83	110	87	29.4	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	33	20	25.1	Routine
	8/7/2008	6:43	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	84	46	75	22.6	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	79	111	28.7	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	83	13	20	22.4	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	79	20	35.0	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
Grand Isle State Park											
GISP2	***Beach Name*** *Grand Isle State Park - 2*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	72.5	79	5	11.1	Field Split
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	72.5	79	5	11.1	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	7.8	5	14.8	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	130	20	16.5	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	66	13	5	12.0	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	73	350	10	8.2	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75	33	5	13.6	Routine
	7/29/200	7:10	High Tide Rising	Rain	Northeast	Light (0-5 mph)	85	46	150	24.8	Routine
	7/31/200	6:49	High Tide Rising	Light Rain	Southwest	Moderate-Light (5-10 mph)	83	130	99	30.2	Routine
	8/5/2008	6:47	Normal	Partly Cloudy	South	Moderate (10-15 mph)	81	49	10	25.3	Routine
	8/7/2008	6:43	Low Tide Falling	Partly Cloudy	Calm	Calm (0 mph)	84	49	10	22.2	Routine
	8/12/200	6:22	High Tide Rising	Partly Cloudy	Southwest	Moderate-Light (5-10 mph)	83	79	87	28.9	Routine
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	83	2	10	21.9	Field Duplicate
	8/19/200	6:49	Normal	Mist	South	Moderate-Light (5-10 mph)	83	4.5	5	21.8	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	23	31	35.0	Routine
	8/26/200	7:10	Normal	Scattered	West	Light (0-5 mph)	77	49	20	35.0	Field Split
Grand Isle State Park											
GISP3	***Beach Name*** *Grand Isle State Park - 3*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	72.5	170	10	11.1	Routine
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	7.8	10	15.5	Field Duplicate
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	33	5	15.5	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	240	5	16.6	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	65	11	10	13.3	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	73	350	20	8.2	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75	49	5	13.4	Routine
Grand Isle State Park											
GISP4	***Beach Name*** *Grand Isle State Park - 4*										
	4/8/2008	10:00	High Tide Falling	Clear	South	Moderate (10-15 mph)	72.5	79	5	11.0	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	4/15/200	7:40	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	59	7.8	5	16.8	Routine
	4/22/200	6:30	High Tide Rising	Partly Cloudy	South	Light (0-5 mph)	72	920	75	16.5	Routine
	4/29/200	6:39	Low Tide	Clear	North	Light (0-5 mph)	64	4.5	5	13.3	Routine
	5/5/2008	6:12	High Tide Rising	Clear	Northeast	Moderate-Light (5-10 mph)	73	1600	31	8.3	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75	240	5	13.5	Routine
	5/13/200	7:00	Normal	Cloudy	East-Southeast	Moderate-Light (5-10 mph)	75	23	5	13.5	Field Duplicate
Gulf Breeze											
GBRZ1			***Beach Name*** *Gulf Breeze*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	71	13	1445	15.3	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	68	2	591	25.2	Routine
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	11	87	16.9	Routine
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	1445	22.9	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	6.8	53	13.5	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	17	64	13.4	Field Split
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	2	87	22.5	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	11	150	16.1	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	49	697	19.7	Routine
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	82	13	504	9.3	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	6.8	429	5.9	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	33	406	10.2	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	4.5	531	19.1	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	1.8	192	19.3	Routine
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	2	42	20.5	Field Duplicate
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	2	20	17.9	Routine
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	111	22.2	Routine
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	288	22.1	Field Duplicate
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	2	31	24.3	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	4.5	238	23.2	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	4.5	75	33.1	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	4.5	10	30.5	Field Split
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	4.5	31	30.3	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	2	20	32.1	Routine
	8/25/200	8:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	6.1	99	35.0	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	4.5	53	35.0	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	2	42	25.7	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	5	21.6	Routine
	10/7/200	9:30	Normal	Cloudy	Southeast	Moderate (10-15 mph)	78	2	53	28.7	Routine
	10/13/20	9:30	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	6.8	42	29.0	Routine
	10/20/20	10:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	5	21.7	Routine
	10/27/20	10:00	Low Tide	Clear	North	Strong (20-35 mph)	66	4	75	35.0	Routine
Hackberry Beach											
HACK1			***Beach Name*** *Hackberry Beach*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	2	99	16.7	Routine
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	68	2	137	26.1	Routine
	4/21/200	9:00	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	23	20	15.7	Routine
	4/21/200	9:00	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	13	31	12.3	Field Split
	4/28/200	8:45	Normal	Partly Cloudy	North	Moderate-Strong (15-20	73	2	344	19.1	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	2	20	11.3	Routine
	5/12/200	8:45	High Tide Falling	Scattered	East-Northeast	Moderate (10-15 mph)	72	13	53	24.6	Routine
	5/19/200	8:45	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	7.8	164	15.2	Routine
	5/27/200	9:00	High Tide	Partly Cloudy	South	Moderate-Strong (15-20	82	11	782	9.7	Routine
	6/3/2008	8:45	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	7.8	124	3.2	Routine
	6/9/2008	10:30	High Tide Falling	Scattered	South	Moderate (10-15 mph)	84	14	42	2.0	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	85	4	504	8.4	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	7.8	192	17.3	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	11	42	17.0	Routine
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	11	111	14.4	Routine
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	2	53	14.3	Field Split
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	324	21.0	Routine
	7/21/200	8:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	2	53	20.0	Routine
	7/21/200	8:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	2	42	20.2	Field Duplicate
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	88	2	222	20.9	Routine
	8/4/2008	8:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	49	5	23.8	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	13	306	28.8	Routine
	8/18/200	8:25	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	89	2	5	31.9	Routine
	8/25/200	8:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	220	222	35.0	Field Duplicate

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	8/25/200	8:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	79	164	35.0	Routine
	9/10/200	8:15	High Tide	Scattered	Northeast	Moderate-Light (5-10 mph)	88	6.8	42	29.1	Routine
Holly Beach											
HOLLY1			***Beach Name*** *Holly Beach - 1*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	13	178	14.2	Routine
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	62	2	137	23.8	Routine
	4/21/200	9:00	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	2	42	19.3	Routine
	4/28/200	8:45	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	429	17.4	Field Split
	4/28/200	8:45	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	87	17.5	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	2	5	11.8	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	2	5	10.2	Field Split
	5/12/200	8:45	High Tide Falling	Scattered	East-Northeast	Moderate (10-15 mph)	72	6.8	64	21.0	Routine
	5/19/200	8:45	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	17	288	15.3	Routine
	5/27/200	9:00	High Tide	Partly Cloudy	South	Moderate-Strong (15-20	82	4.5	591	15.8	Routine
	6/3/2008	8:45	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	23	222	8.1	Routine
	6/9/2008	9:00	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	26	20	4.9	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	49	344	7.4	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	17	222	15.9	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	2	87	18.9	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	6.8	75	15.1	Routine
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	84	4.5	137	20.9	Routine
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	13	42	17.1	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	4.5	478	21.6	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	2	42	24.6	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	7.8	87	31.0	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	130	53	31.6	Routine
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	33	87	35.0	Field Duplicate
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	33	75	35.0	Routine
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	2	5	35.0	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	14	5	20.5	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	4.5	10	20.6	Field Split
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	42	28.5	Routine
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	75	22.9	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	31	24.1	Routine
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	68	1.8	10	30.9	Routine
Holly Beach											
HOLLY2			***Beach Name*** *Holly Beach - 2*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	33	99	13.8	Routine
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	60	33	99	23.9	Routine
	4/21/200	9:00	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	2	31	19.4	Routine
	4/28/200	8:45	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	624	18.7	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	6.8	5	12.9	Routine
	5/12/200	8:45	High Tide Falling	Scattered	East-Northeast	Moderate (10-15 mph)	72	4.5	64	22.2	Routine
	5/19/200	8:45	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	17	111	15.1	Field Duplicate
	5/19/200	8:45	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	7.8	306	15.2	Routine
	5/27/200	9:00	High Tide	Partly Cloudy	South	Moderate-Strong (15-20	82	33	2005	15.9	Routine
	6/3/2008	8:45	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	13	150	8.3	Routine
	6/9/2008	9:00	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	33	53	5.1	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	49	178	7.8	Field Duplicate
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	49	659	7.8	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	33	207	17.0	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	2	20	14.7	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	49	53	15.1	Routine
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	84	11	75	16.1	Field Split
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	84	2	53	20.7	Routine
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	23	53	23.0	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	2	238	20.1	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	7.8	31	27.7	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	4.5	87	31.4	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	33	31	31.4	Routine
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	49	124	35.0	Routine
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	11	10	35.0	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	5	26.7	Routine
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	87	28.5	Routine
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	53	28.2	Routine
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	53	24.2	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	10	24.1	Field Duplicate
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	68	2	20	31.0	Routine
Holly Beach											
HOLLY3			***Beach Name*** *Holly Beach - 3*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	23	164	17.9	Routine
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	60	2	192	23.8	Routine
	4/21/200	9:00	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	11	31	19.9	Routine
	4/28/200	8:45	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	2005	20.6	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	7.8	31	12.9	Routine
	5/12/200	8:45	High Tide Falling	Scattered	East-Northeast	Moderate (10-15 mph)	72	2	53	22.1	Routine
	5/19/200	8:45	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	13	504	15.3	Routine
	5/27/200	9:00	High Tide	Partly Cloudy	South	Moderate-Strong (15-20	82	49	178	15.1	Routine
	6/3/2008	8:45	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	27	111	8.3	Routine
	6/9/2008	9:00	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	6.8	99	5.3	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	31	429	7.6	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	17	87	13.3	Field Split
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	22	87	14.7	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	7.8	207	14.6	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	79	124	19.4	Routine
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	84	4.5	111	20.8	Routine
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	12	137	23.3	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	2	207	21.8	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	33	53	32.0	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	2	53	31.3	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	79	5	31.6	Routine
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	31	64	35.0	Routine
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	2	5	33.8	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	21	192	24.6	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	20	20.5	Routine
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	10	29.0	Routine
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	75	30.2	Field Split
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	4	42	23.8	Routine
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	10	23.7	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	68	2	31	30.7	Routine
Holly Beach											
HOLLY4			***Beach Name*** *Holly Beach - 4*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	13	87	17.1	Routine
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	60	17	222	23.6	Field Split
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	60	13	164	23.5	Routine
	4/21/200	9:00	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	13	42	20.2	Routine
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	4.5	2005	20.0	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	11	42	13.1	Routine
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	11	254	25.0	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	13	453	15.3	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	33	1652	15.7	Routine
	6/3/2008	8:45	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	49	164	8.2	Field Split
	6/3/2008	8:45	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	79	344	7.9	Routine
	6/9/2008	9:00	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	17	53	5.0	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	33	364	8.0	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	2	64	14.9	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	13	178	19.0	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	49	87	15.9	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	49	64	18.8	Field Duplicate
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	84	2	271	20.9	Routine
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	93	53	23.4	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	2	271	20.2	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	280	137	31.7	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	2	53	31.5	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	33	5	31.5	Routine
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	17	99	35.0	Routine
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	1.8	10	34.2	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	6.8	150	24.8	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	20	21.0	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	4.5	31	26.4	Field Split
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	10	29.0	Routine
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	4.5	42	30.4	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	20	22.9	Routine
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	68	2	10	30.7	Routine
Holly Beach											
HOLLY5			***Beach Name*** *Holly Beach - 5*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	17	75	17.7	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	60	2	288	23.6	Field Duplicate
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	60	2	306	23.6	Routine
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	33	20	15.6	Routine
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	1.8	1298	18.4	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	13	20	13.1	Routine
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	70	324	25.5	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	7.8	306	15.4	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	49	42	15.8	Routine
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	33	254	8.4	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	17	53	5.1	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	17	53	5.0	Field Split
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	79	624	7.8	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	110	453	16.1	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	33	137	18.7	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	27	99	17.4	Routine
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	84	2	324	21.2	Routine
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	4.5	64	22.2	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	6.8	222	17.1	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	79	178	31.0	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	2	75	31.0	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	49	111	31.5	Routine
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	23	137	35.0	Routine
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	7.8	5	33.1	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	4.5	178	24.4	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	10	26.1	Routine
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	42	28.5	Routine
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	11	75	30.2	Routine
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	31	22.5	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	68	2	31	30.7	Routine
Holly Beach											
HOLLY6			***Beach Name*** *Holly Beach - 6*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	4.5	192	13.9	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	60	2	624	23.9	Routine
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	46	42	15.8	Routine
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	22	20	15.7	Field Split
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	1013	20.0	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	11	10	13.2	Routine
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	11	504	24.6	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	11	429	15.2	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	33	344	16.1	Routine
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	33	254	8.5	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	33	53	5.0	Field Duplicate
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	49	20	5.0	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	4.5	384	8.8	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	2	53	13.4	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	21	192	19.1	Routine
	7/7/2008	7:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	11	64	18.2	Routine
	7/14/200	7:15	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	84	4.5	1184	20.9	Routine
	7/21/200	7:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	2	20	22.9	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	4.5	324	20.7	Routine
	8/4/2008	7:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	23	111	31.7	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	2	164	31.0	Routine
	8/18/200	7:40	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	240	5	31.2	Routine
	8/25/200	7:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	17	137	35.0	Routine
	9/10/200	7:15	High Tide	Scattered	North-Northeast	Moderate-Light (5-10 mph)	88	2	5	33.9	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	4.5	75	25.0	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	1.8	5	20.7	Field Split
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	20	26.7	Routine
	10/7/200	8:15	Normal	Partly Cloudy	Southeast	Moderate (10-15 mph)	78	2	20	29.0	Routine
	10/13/20	8:15	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	99	30.2	Routine
	10/20/20	10:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	31	22.5	Routine

Beach / Station ID	Date	Time	Tide	Weather	Wind Direction	Wind Speed	Water Temp	Fecal Coliform	Entero-cocci	Salinity	Sample Type
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	68	2	31	30.8	Routine
Little Florida											
LTFL1			***Beach Name*** *Little Florida*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	71	4.5885	13	13.0	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	70	2	429	26.3	Routine
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	23	164	21.9	Routine
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	738	23.0	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	2	42	13.6	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	7.8	42	13.0	Field Duplicate
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	2	42	21.4	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	49	504	15.6	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	2	624	16.7	Routine
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	7.8	504	9.3	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	4.5	1091	5.7	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	11	207	10.1	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	2	364	18.6	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	2	99	20.2	Routine
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	2	42	20.7	Routine
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	111	22.1	Routine
	7/21/200	8:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	7.8	164	24.5	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	4	164	18.5	Routine
	8/4/2008	8:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	2	10	33.2	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	4.5	20	30.3	Routine
	8/18/200	8:25	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	2	10	32.6	Routine
	8/25/200	8:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	2	111	35.0	Routine
	9/10/200	8:15	High Tide	Scattered	Northeast	Moderate-Light (5-10 mph)	88	2	53	35.0	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	13	87	26.4	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	5	21.6	Routine
	10/7/200	9:30	Normal	Cloudy	Southeast	Moderate (10-15 mph)	78	2	64	28.4	Routine
	10/13/20	9:30	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	6.8	99	29.5	Routine
	10/20/20	10:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	17	5	21.8	Routine
	10/27/20	10:00	Low Tide	Clear	North	Strong (20-35 mph)	66	2	64	30.3	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
Martin Beach											
MART1	***Beach Name*** *Martin Beach*										
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	71	2	178	13.6	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	68	2	42	26.6	Routine
	4/14/200	8:00	Extremely Low	Clear	North	Moderate-Light (5-10 mph)	68	2	75	26.0	Field Split
	4/21/200	7:45	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	17	87	22.0	Routine
	4/28/200	7:30	Normal	Partly Cloudy	North	Moderate-Strong (15-20	72	2	344	20.3	Routine
	5/5/2008	7:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	74	2	53	13.7	Routine
	5/12/200	7:30	High Tide Falling	Partly Cloudy	Northeast	Moderate (10-15 mph)	72	2	53	22.6	Routine
	5/19/200	7:30	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	110	1445	15.5	Routine
	5/27/200	7:30	High Tide	Scattered	South	Moderate (10-15 mph)	82	7.8	429	21.5	Routine
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	23	782	9.9	Field Duplicate
	6/3/2008	7:30	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	33	560	9.8	Routine
	6/9/2008	7:30	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	2	831	5.7	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	84	33	207	10.3	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	2	697	14.8	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	2	31	21.0	Routine
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	2	20	20.8	Routine
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	288	24.0	Routine
	7/21/200	8:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	4.5	10	24.8	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	87	2	10	24.9	Routine
	8/4/2008	8:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	2	64	33.3	Field Duplicate
	8/4/2008	8:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	2	31	33.1	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	2	20	30.4	Routine
	8/18/200	8:25	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	88	2	10	33.1	Routine
	8/25/200	8:30	Normal	Clear	Northwest	Moderate (10-15 mph)	86	7.8	2005	35.0	Routine
	9/10/200	8:15	High Tide	Scattered	Northeast	Moderate-Light (5-10 mph)	88	2	5	35.0	Field Split
	9/10/200	8:15	High Tide	Scattered	Northeast	Moderate-Light (5-10 mph)	88	2	20	35.0	Routine
	9/23/200	8:00	Normal	Scattered	East-Northeast	Moderate (10-15 mph)	85	2	20	26.4	Routine
	9/29/200	8:00	Low Tide	Clear	Northeast	Light (0-5 mph)	75	2	5	23.0	Routine
	10/7/200	9:30	Normal	Cloudy	Southeast	Moderate (10-15 mph)	78	7.8	99	28.3	Routine
	10/13/20	9:30	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	64	29.2	Routine
	10/20/20	10:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	5	21.3	Routine

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
	10/27/20	10:00	Low Tide	Clear	North	Strong (20-35 mph)	66	1.8	42	29.8	Routine
Pontchartrain Beach											
PONT1			***Beach Name*** *Pontchartrain Beach*								
	4/8/2008	8:30	Low Tide Falling	Partly Cloudy	North-Northeast	Moderate-Light (5-10 mph)	72.3	170	10	4.7	Routine
	4/15/200	9:45	Low Tide Falling	Clear	East-Southeast	Moderate-Light (5-10 mph)	64	46	20	4.1	Routine
	4/22/200	10:00	Low Tide Falling	Scattered	Northeast	Light (0-5 mph)		23	5	4.7	Routine
	5/6/2008	9:15	High Tide	Partly Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75.2	17	5	1.1	Routine
	5/13/200	9:15	Low Tide Falling	Clear	East-Northeast	Moderate-Light (5-10 mph)	76.3	2	5	1.0	Routine
	5/20/200	9:15	High Tide Falling	Clear	West	Moderate (10-15 mph)	78	4.5	5		Routine
	5/27/200	9:00	Low Tide Falling	Scattered	Southeast	Moderate-Light (5-10 mph)	80	33	5	1.9	Routine
	6/5/2008	9:30	Low Tide Falling	Partly Cloudy	Southeast	Light (0-5 mph)	80	4.5	42	2.6	Routine
	6/10/200	10:00	Low Tide	Partly Cloudy	Southeast	Light (0-5 mph)	86	2	5	2.7	Routine
	6/17/200	9:30	High Tide	Clear	Northeast	Light (0-5 mph)	86	7.8	5	2.5	Routine
	7/1/2008	8:45	High Tide	Scattered	Northeast	Moderate-Light (5-10 mph)	84	49	5	3.2	Routine
	7/8/2008	9:15	Low Tide Falling	Partly Cloudy	East-Southeast	Light (0-5 mph)	87	2	5	3.1	Routine
	7/15/200	9:35	Normal	Clear	North-Northeast	Moderate-Light (5-10 mph)	86	11	20	3.0	Routine
	7/22/200	9:15	Low Tide	Partly Cloudy	East-Southeast	Light (0-5 mph)	87	33	5	3.1	Routine
	7/29/200	9:15	High Tide Rising	Cloudy	Southeast	Light (0-5 mph)	86	33	5	3.5	Routine
	8/5/2008	9:00	Low Tide Falling	Cloudy	Southeast	Moderate-Light (5-10 mph)	85	13	10	4.5	Field Duplicate
	8/5/2008	9:00	Low Tide Falling	Cloudy	Southeast	Moderate-Light (5-10 mph)	85	33	5	4.5	Routine
	8/12/200	9:15	Low Tide Falling	Scattered	South-Southwes	Moderate (10-15 mph)	83	70	99	3.8	Routine
	8/19/200	9:15	Low Tide	Partly Cloudy	East-Southeast	Light (0-5 mph)	85	4.5	5	4.2	Routine
	8/26/200	9:15	High Tide Rising	Scattered	Southwest	Moderate-Light (5-10 mph)	80	33	10	5.2	Routine
	9/9/2008	9:15	High Tide Rising	Partly Cloudy	North-Northwest	Light (0-5 mph)	84	170	64	6.0	Routine
	9/16/200	9:30	High Tide Falling	Partly Cloudy	North-Northeast	Light (0-5 mph)	80	7.8	20	7.7	Routine
	9/23/200	9:15	High Tide Rising	Scattered	North-Northeast	Moderate-Light (5-10 mph)	80	4.5	20	7.5	Routine
	9/30/200	9:15	High Tide Falling	Clear	North	Moderate-Light (5-10 mph)	81	17	5	6.0	Routine
	10/7/200	9:15	High Tide Rising	Cloudy	East-Northeast	Light (0-5 mph)	81	7.8	64	7.7	Routine
	10/14/20	9:15	High Tide Falling	Cloudy	Northeast	Moderate (10-15 mph)	78	23	20	9.5	Routine
	10/21/20	9:15	High Tide Falling	Partly Cloudy	Northwest	Moderate-Light (5-10 mph)	71	2	5	8.4	Routine
	10/28/20	10:15		Clear	Northeast	Moderate (10-15 mph)	63	49	10	6.6	Routine
Rutherford Beach											

Beach *Station ID*	*Date*	*Time*	*Tide*	*Weather*	*Wind Direction*	*Wind Speed*	*Water Temp*	*Fecal Coliform*	*Entero-cocci*	*Salinity*	*Sample Type*
RUTH1			***Beach Name*** *Rutherford Beach*								
	4/7/2008	8:20	Normal	Fog	East-Northeast	Light (0-5 mph)	70	4.5	254	18.1	Routine
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	68	2	53	25.1	Field Duplicate
	4/14/200	9:10	Extremely Low	Clear	East-Northeast	Moderate-Light (5-10 mph)	68	2	53	25.3	Routine
	4/21/200	9:00	Normal	Cloudy	Southeast	Moderate (10-15 mph)	74	9.2	42	16.2	Routine
	4/28/200	8:45	Normal	Partly Cloudy	North	Moderate-Strong (15-20	73	2	531	19.8	Field Duplicate
	4/28/200	8:45	Normal	Partly Cloudy	North	Moderate-Strong (15-20	73	20	478	19.8	Routine
	5/5/2008	8:45	Normal	Cloudy	East-Northeast	Moderate-Light (5-10 mph)	75	4.5	31	11.5	Routine
	5/12/200	8:45	High Tide Falling	Scattered	East-Northeast	Moderate (10-15 mph)	72	9.3	150	25.1	Routine
	5/19/200	8:45	High Tide Falling	Scattered	Southwest	Moderate-Light (5-10 mph)	76	33	87	15.5	Routine
	5/27/200	9:00	High Tide	Partly Cloudy	South	Moderate-Strong (15-20	82	2	560	9.6	Routine
	6/3/2008	8:45	High Tide Falling	Scattered	South-Southwes	Moderate-Strong (15-20	83	23	53	3.4	Routine
	6/9/2008	9:00	High Tide Falling	Scattered	South	Moderate-Strong (15-20	84	2	99	2.0	Routine
	6/16/200	7:00	High Tide Falling	Scattered	West-Northwest	Light (0-5 mph)	85	49	1184	7.9	Routine
	6/23/200	7:18	High Tide	Scattered	West-Northwest	Light (0-5 mph)	85	13	222	17.1	Routine
	6/30/200	7:15	Normal	Cloudy	Northwest	Light (0-5 mph)	85	4	42	17.5	Routine
	7/7/2008	8:15	High Tide	Partly Cloudy	Southeast	Moderate-Light (5-10 mph)	85	7.8	31	14.5	Routine
	7/14/200	8:20	Low Tide Falling	Partly Cloudy	Northwest	Light (0-5 mph)	85	2	885	20.4	Routine
	7/21/200	8:00	High Tide Falling	Clear	Northwest	Moderate-Light (5-10 mph)	86	2	42	20.3	Routine
	7/28/200	7:30	Normal	Clear	Northwest	Light (0-5 mph)	88	2	238	20.6	Routine
	8/4/2008	8:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	33	64	28.4	Field Split
	8/4/2008	8:30	Normal	Scattered	Northeast	Moderate-Light (5-10 mph)	86	33	87	28.4	Routine
	8/11/200	7:45	Normal	Partly Cloudy	South-Southwes	Moderate-Strong (15-20	88	17	87	29.0	Routine
	8/18/200	8:25	Normal	Partly Cloudy	Northeast	Light (0-5 mph)	89	1.8	31	31.9	Routine
	8/25/200	8:30	Normal	Clear	Northwest	Moderate (10-15 mph)	85	49	31	35.0	Routine
	9/10/200	8:15	High Tide	Scattered	Northeast	Moderate-Light (5-10 mph)	88	4.5	10	29.5	Routine
	10/13/20	9:30	Normal	Cloudy	East-Southeast	Moderate (10-15 mph)	75	2	53	30.7	Routine
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	5	23.4	Field Split
	10/20/20	8:30	Normal	Clear	East-Northeast	Moderate-Light (5-10 mph)	73	2	10		Routine
	10/27/20	7:40	Low Tide	Clear	North	Moderate-Strong (15-20	68	2	10	30.0	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 are 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.

APPENDIX E

Predictive Model Results

Predictive Model Results
Log_e Enterococci Response

FNTB

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
Sunny	1	16.6711	16.67107	8.84372	0.003511013
precip48	1	28.1396	28.13957	14.92756	0.000176032
Residuals	129	243.1747	1.88508		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	2.6969	0.1773	15.2143	0.0000
Sunny	-0.4946	0.2487	-1.9889	0.0488
precip48	0.5502	0.1424	3.8636	0.0002

Other Model Statistics

Multiple R-Squared: 0.1556
F-statistic: 11.89 on 2 and 129 degrees of freedom, the p-value is 0.0000183
2 observations deleted due to missing values

CYPT

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
TideHNL	2	17.5916	8.795807	4.866069	0.00907576
WindDirNSEW	4	21.8427	5.460668	3.020983	0.02000797
as.numeric(WindSpeed)	1	5.0281	5.028142	2.781698	0.09761462
precip48	1	6.7780	6.778009	3.749770	0.05485858
Residuals	138	249.4460	1.807580		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	2.3523	0.7218	3.2590	0.0014
TideHNLL	-0.3125	0.2918	-1.0709	0.2861
TideHNLN	-0.8512	0.2877	-2.9585	0.0036
WindDirNSEWE	-0.2059	0.7618	-0.2703	0.7874
WindDirNSEWN	0.7779	0.7572	1.0274	0.3060
WindDirNSEWS	0.0971	0.7592	0.1278	0.8985
WindDirNSEWW	0.0434	0.8146	0.0533	0.9576
as.numeric(WindSpeed)	0.2044	0.1269	1.6110	0.1095
precip48	0.4299	0.2220	1.9364	0.0549

Other Model Statistics

Multiple R-Squared: 0.1704
F-statistic: 3.543 on 8 and 138 degrees of freedom, the p-value is 0.0009219

GISP

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
precip72	1	40.1111	40.11114	39.00349	0.000000001
WindDirNSEW	4	16.1047	4.02619	3.91501	0.003847655
Sunny	1	17.5974	17.59740	17.11146	0.000041261
Residuals	507	521.3982	1.02840		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	2.6135	0.1168	22.3682	0.0000
precip72	0.2986	0.0513	5.8190	0.0000
WindDirNSEWE	-0.4215	0.1481	-2.8464	0.0046
WindDirNSEWN	-0.0296	0.1598	-0.1852	0.8532
WindDirNSEWS	-0.0755	0.1349	-0.5596	0.5760
WindDirNSEWW	0.2043	0.1988	1.0275	0.3047
Sunny	-0.4688	0.1133	-4.1366	0.0000

Other Model Statistics

Multiple R-Squared: 0.124
F-statistic: 11.96 on 6 and 507 degrees of freedom, the p-value is 1.401e-012

GIB

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
TideHNL	2	12.0224	6.011178	8.478729	0.00025755
WindDirNSEW	4	9.4465	2.361617	3.331046	0.01080861
as.numeric(WindSpeed)	1	6.8200	6.820024	9.619601	0.00209432
precip0	1	6.9098	6.909834	9.746278	0.00195875
Residuals	324	229.7068	0.708972		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	2.0257	0.1451	13.9647	0.0000
TideHNLL	-0.4388	0.1087	-4.0379	0.0001
TideHNLN	-0.3006	0.1244	-2.4170	0.0162
WindDirNSEWE	-0.2401	0.1796	-1.3365	0.1823
WindDirNSEWN	-0.2276	0.1897	-1.1999	0.2311
WindDirNSEWS	-0.3147	0.1773	-1.7747	0.0769
WindDirNSEWW	0.3571	0.2250	1.5866	0.1136
as.numeric(WindSpeed)	0.1793	0.0545	3.2914	0.0011
precip0	0.3477	0.1114	3.1219	0.0020

Other Model Statistics

Multiple R-Squared: 0.1329
F-statistic: 6.206 on 8 and 324 degrees of freedom, the p-value is 1.816e-007

FOUR

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
TideHNL	2	6.3644	3.18220	2.96772	0.05317207
Sunny	1	13.3969	13.39685	12.49390	0.00048344
WindDirNSEW	4	55.9175	13.97937	13.03715	0.00000000
Salinity	1	11.3131	11.31309	10.55058	0.00131492
precip48	1	5.4119	5.41194	5.04718	0.02550891
Residuals	259	277.7184	1.07227		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	1.8950	0.3644	5.1999	0.0000
TideHNLL	-0.5014	0.1541	-3.2535	0.0013
TideHNLN	-0.4313	0.1648	-2.6165	0.0094
Sunny	-0.4497	0.1775	-2.5331	0.0119
WindDirNSEWE	-0.4504	0.2038	-2.2094	0.0280
WindDirNSEWN	-0.2097	0.2369	-0.8852	0.3769
WindDirNSEWS	0.0026	0.1884	0.0136	0.9892
WindDirNSEWW	1.3242	0.2651	4.9952	0.0000
Salinity	0.0379	0.0121	3.1258	0.0020
precip48	0.1841	0.0820	2.2466	0.0255

Other Model Statistics

Multiple R-Squared: 0.2497
F-statistic: 9.575 on 9 and 259 degrees of freedom, the p-value is 1.336e-012
15 observations deleted due to missing values

Grand Isle Area Group

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
WindDirNSEW	4	52.403	13.10085	12.42769	0.00000000068
WaterTemp	1	20.141	20.14132	19.10639	0.00001350781
precip72	1	31.863	31.86252	30.22533	0.00000004758
Residuals	1124	1184.883	1.05417		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	0.7205	0.4210	1.7115	0.0873
WindDirNSEWE	-0.1636	0.1036	-1.5789	0.1146
WindDirNSEWN	0.0625	0.1147	0.5449	0.5860
WindDirNSEWS	0.1146	0.0901	1.2715	0.2038
WindDirNSEWW	0.6499	0.1330	4.8851	0.0000
WaterTemp	0.0195	0.0050	3.9065	0.0001
precip72	0.1962	0.0357	5.4978	0.0000

Other Model Statistics

Multiple R-Squared: 0.08098
F-statistic: 16.51 on 6 and 1124 degrees of freedom, the p-value is 0

HACK-RUTH

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
WindDirNSEW	3	34.9186	11.63953	8.15698	0.000039148
as.numeric(WindSpeed)	1	23.8433	23.84334	16.70941	0.000064494
Salinity	1	10.2463	10.24631	7.18061	0.008023526
precip72	1	11.5610	11.56095	8.10191	0.004912961
Residuals	188	268.2649	1.42694		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	3.8562	0.4396	8.7728	0.0000
WindDirNSEWN	-0.3407	0.2567	-1.3271	0.1861
WindDirNSEWS	0.0389	0.2392	0.1627	0.8709
WindDirNSEWW	1.2061	0.3782	3.1886	0.0017
as.numeric(WindSpeed)	0.3351	0.0949	3.5321	0.0005
Salinity	-0.0312	0.0125	-2.4883	0.0137
precip72	-0.3607	0.1267	-2.8464	0.0049

Other Model Statistics

Multiple R-Squared: 0.231
F-statistic: 9.41 on 6 and 188 degrees of freedom, the p-value is 4.958e-009
4 observations deleted due to missing values

HOLLY

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
TideHNL	2	49.768	24.88423	15.23963	0.0000003470
WindDirNSEW	3	35.482	11.82743	7.24337	0.0000881015
as.numeric(WindSpeed)	1	18.464	18.46389	11.30767	0.0008197890
Salinity	1	28.650	28.65011	17.54593	0.0000321501
WindDirNSEW:as.numeric(WindSpeed)	3	62.033	20.67752	12.66335	0.0000000485
Residuals	615	1004.211	1.63286		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	3.9504	0.4175	9.4623	0.0000
TideHNLL	-0.4781	0.1585	-3.0165	0.0027
TideHNLN	-0.0535	0.1205	-0.4441	0.6571
WindDirNSEWN	-0.5040	0.4475	-1.1264	0.2604
WindDirNSEWS	1.4646	0.4624	3.1671	0.0016
WindDirNSEWW	-3.6736	1.3074	-2.8098	0.0051
as.numeric(WindSpeed)	0.2241	0.1169	1.9175	0.0556
Salinity	-0.0422	0.0086	-4.9202	0.0000
WindDirNSEWNas.numeric(WindSpeed)	0.3005	0.1548	1.9412	0.0527
WindDirNSEWSas.numeric(WindSpeed)	-0.3189	0.1414	-2.2549	0.0245
WindDirNSEWWas.numeric(WindSpeed)	2.1616	0.5853	3.6934	0.0002

Other Model Statistics

Multiple R-Squared: 0.1622
F-statistic: 11.91 on 10 and 615 degrees of freedom, the p-value is 0

CNSTBC

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
Sunny	1	39.467	39.46733	18.03750	0.00002566
WindDirNSEW	3	17.841	5.94713	2.71798	0.04401866
as.numeric(WindSpeed)	1	52.022	52.02240	23.77547	0.00000144
Salinity	1	69.061	69.06091	31.56247	0.00000003
Residuals	521	1139.985	2.18807		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	4.0163	0.3348	11.9952	0.0000
Sunny	-0.7117	0.2106	-3.3802	0.0008
WindDirNSEWN	0.4396	0.2035	2.1596	0.0313
WindDirNSEWS	0.2937	0.1779	1.6506	0.0994
WindDirNSEWW	0.8976	0.3108	2.8878	0.0040
as.numeric(WindSpeed)	0.3306	0.0679	4.8681	0.0000
Salinity	-0.0591	0.0105	-5.6180	0.0000

Other Model Statistics

Multiple R-Squared: 0.1353
F-statistic: 13.59 on 6 and 521 degrees of freedom, the p-value is 2.354e-014
1 observations deleted due to missing values

Cameron Area Group

Analysis of Variance Table

Source	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
TideHNL	2	73.592	36.79609	20.15024	0.0000000024
Sunny	1	27.642	27.64170	15.13712	0.0001049009
WindDirNSEW	3	66.884	22.29463	12.20897	0.0000000697
as.numeric(WindSpeed)	1	83.091	83.09150	45.50249	0.0000000000
Salinity	1	99.199	99.19930	54.32343	0.0000000000
preciplag1	1	30.898	30.89795	16.92031	0.0000413636
WindDirNSEW:as.numeric(WindSpeed)	3	47.922	15.97384	8.74758	0.0000095464
Residuals	1336	2439.652	1.82609		

Table of Regression Coefficients

Predictor	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	4.1500	0.2996	13.8516	0.0000
TideHNLL	-0.2342	0.1157	-2.0236	0.0432
TideHNLN	0.0851	0.0891	0.9548	0.3399
Sunny	-0.5380	0.1276	-4.2176	0.0000
WindDirNSEWN	-0.3922	0.3157	-1.2421	0.2144
WindDirNSEWS	0.6889	0.3360	2.0502	0.0405
WindDirNSEWW	-1.9822	0.9360	-2.1176	0.0344
as.numeric(WindSpeed)	0.2253	0.0837	2.6907	0.0072
Salinity	-0.0469	0.0061	-7.6453	0.0000
preciplag1	-0.6894	0.1788	-3.8557	0.0001
WindDirNSEWNas.numeric(WindSpeed)	0.2562	0.1097	2.3358	0.0196
WindDirNSEWSas.numeric(WindSpeed)	-0.1161	0.1026	-1.1316	0.2580
WindDirNSEWWas.numeric(WindSpeed)	1.3594	0.4198	3.2381	0.0012

Other Model Statistics

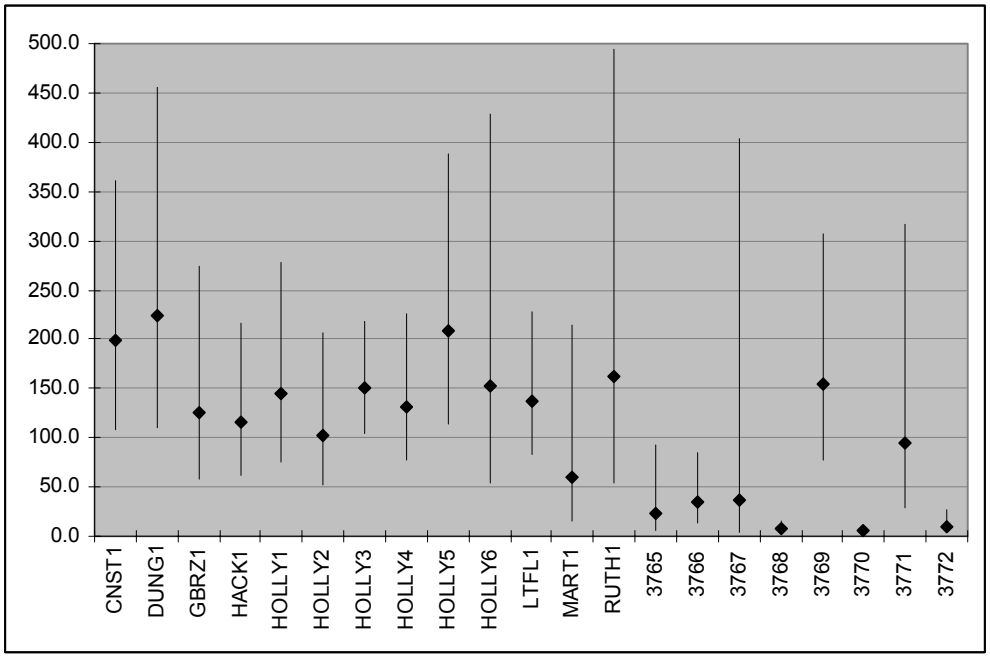
Multiple R-Squared: 0.1496
F-statistic: 19.59 on 12 and 1336 degrees of freedom, the p-value is 0
5 observations deleted due to missing values

APPENDIX F

Calcasieu River Study Results

Enterococci geometric means (mpn/100ml) for samples collected between 18 June and 29 July 2008 at LDEQ sample stations for the Calcasieu River Study and at BEACH Program sample stations.

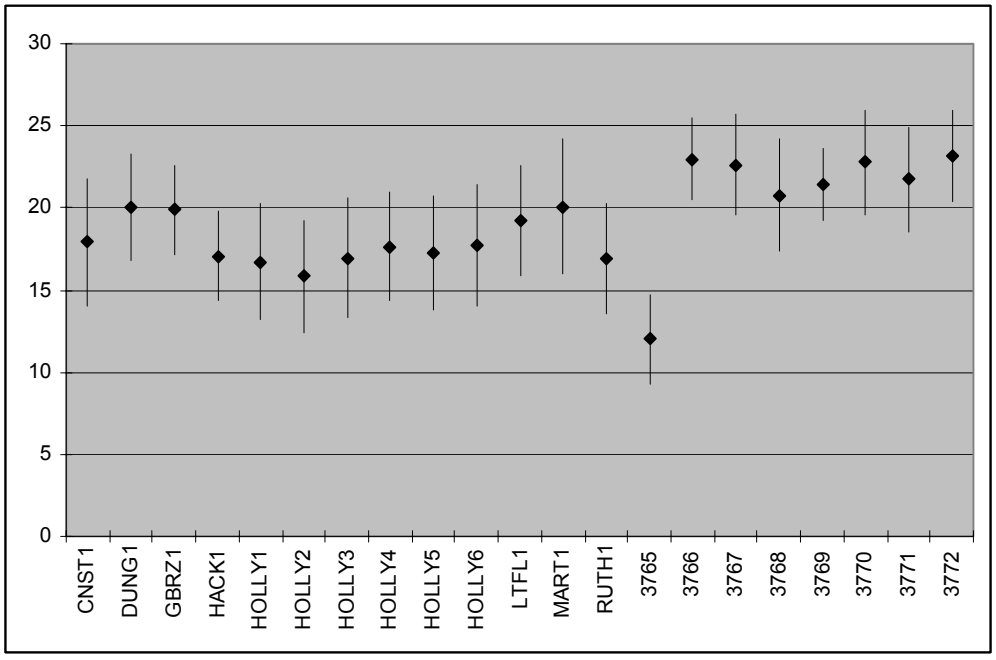
Station ID	Upper 95% CI	Lower 95% CI	Geometric Mean	Log_e Mean	Log_e Std. Dev.	Log_e Std. Error	Sample Size
CNST1	361.8	108.8	198.4	5.290	0.867	0.307	8
DUNG1	454.9	109.9	223.6	5.410	1.025	0.362	8
GBRZ1	274.5	58.2	126.3	4.839	1.187	0.396	9
HACK1	215.6	62.5	116.1	4.754	0.947	0.316	9
HOLLY1	277.7	76.1	145.3	4.979	0.874	0.330	7
HOLLY2	206.1	51.4	102.9	4.634	1.063	0.354	9
HOLLY3	218.7	103.5	150.4	5.014	0.540	0.191	8
HOLLY4	225.2	76.9	131.6	4.880	0.775	0.274	8
HOLLY5	387.1	113.3	209.4	5.344	0.829	0.314	7
HOLLY6	428.6	54.3	152.5	5.027	1.395	0.527	7
LTFL1	227.0	83.4	137.6	4.925	0.675	0.255	7
MART1	214.5	16.4	59.3	4.082	1.735	0.656	7
RUTH1	493.8	53.7	162.8	5.092	1.498	0.566	7
3765	92.7	5.5	22.6	3.117	1.440	0.720	4
3766	85.9	14.2	34.9	3.553	0.918	0.459	4
3767	403.8	3.3	36.8	3.604	2.445	1.223	4
3768	16.1	4.4	8.4	2.129	0.664	0.332	4
3769	306.1	78.2	154.7	5.041	0.697	0.348	4
3770	8.4	4.2	5.9	1.783	0.347	0.173	4
3771	315.8	28.7	95.1	4.555	1.224	0.612	4
3772	27.1	3.8	10.1	2.315	1.003	0.502	4



Enterococci geometric means (mpn/100ml; diamonds) and associated upper and lower 95% confidence limits for samples collected between 18 June and 29 July 2008 at LDEQ sample stations for the Calcasieu River Study and at BEACH Program sample stations.

Salinity means (ppt) for samples collected between 18 June and 29 July 2008 at LDEQ sample stations for the Calcasieu River Study and at BEACH Program sample stations.

Station ID	Upper 95% CI	Lower 95% CI	Mean	Std. Dev.	Std. Error	Sample Size
CNST1	21.7	14.1	17.9	5.554	1.964	8
DUNG1	23.3	16.7	20.0	4.742	1.677	8
GBRZ1	22.6	17.1	19.9	4.181	1.394	9
HACK1	19.8	14.3	17.1	4.161	1.387	9
HOLLY1	20.2	13.2	16.7	4.767	1.802	7
HOLLY2	19.3	12.3	15.8	5.310	1.770	9
HOLLY3	20.6	13.3	16.9	5.291	1.871	8
HOLLY4	20.9	14.4	17.6	4.736	1.674	8
HOLLY5	20.7	13.7	17.2	4.706	1.779	7
HOLLY6	21.4	14.1	17.7	4.936	1.866	7
LTFL1	22.6	15.9	19.2	4.535	1.714	7
MART1	24.2	16.0	20.1	5.564	2.103	7
RUTH1	20.3	13.5	16.9	4.558	1.723	7
3765	14.7	9.3	12.0	2.786	1.393	4
3766	25.4	20.5	23.0	2.508	1.254	4
3767	25.7	19.6	22.6	3.098	1.549	4
3768	24.2	17.3	20.7	3.482	1.741	4
3769	23.6	19.3	21.5	2.229	1.114	4
3770	26.0	19.6	22.8	3.258	1.629	4
3771	24.9	18.6	21.8	3.246	1.623	4
3772	26.0	20.4	23.2	2.838	1.419	4



Salinity means (ppt) and associated upper and lower 95% confidence limits for samples collected between 18 June and 29 July 2008 at LDEQ sample stations for the Calcasieu River Study and at BEACH Program sample stations.