Status of Texas Coastal Beaches: An Assessment of Texas Beach Watch Program Data

(August 27, 2008)

Texas Beach Watch Program

The Texas Beach Watch Program (TBWP) was implemented by the Texas General Land Office (GLO) in the late 1990s. Initial funding for TBWP came from the State's Coastal Management Program. In 2000, Congress passed the Beaches Environmental Assessment and Coastal Health (BEACH) Act to protect public health in coastal recreational waters.

The BEACH Act requires that states, in cooperation with EPA, develop and implement a program to monitor for pathogens and pathogen indicators in coastal recreation waters adjacent to public bathing beaches. The Act also requires public notification when water quality standards for pathogens or *pathogen indicators* are exceeded.

Indicator Organisms

Indicator organisms are a fundamental monitoring tool used to measure both changes in environmental (water) quality or conditions and the potential presence of hard-to-detect target pathogenic organisms. An indicator organism provides evidence of the presence or absence of a pathogenic organism that survives under similar physical, chemical, and nutrient conditions. Indicator organisms have the following characteristics:

- Are easily detected using simple laboratory tests.
- Generally not be present in unpolluted waters.
- Appear in concentrations that can be correlated with the extent of contamination.
- Have a die-off rate that is not faster than the die-off rate of the pathogens of concern.

Because it is difficult to directly detect the many different pathogens or parasites that may be present in surface waters, the presence of fecal bacteria has long been used as an indicator of the possible presence of disease-causing organisms. The bacterial group used for the Texas Beach Watch Program and other coastal states is *Enterococcus*.

Texas Beach Watch Monitoring Activities

In the past five years, Texas has received more than $2.5 million in federal funding to meet the requirements of the BEACH Act through the TBWP. Currently, the TBWP collects water samples from 163 stations along the Texas coast in Aransas, Brazoria, Cameron, Galveston, Jefferson, Matagorda, Kleberg, San Patricio, and Nueces Counties. The GLO contracts with universities, local governments and laboratories to collect these samples and test them for the presence of Enterococcus. Samples are collected weekly during the peak beach season from May through September and every other week from October through April.

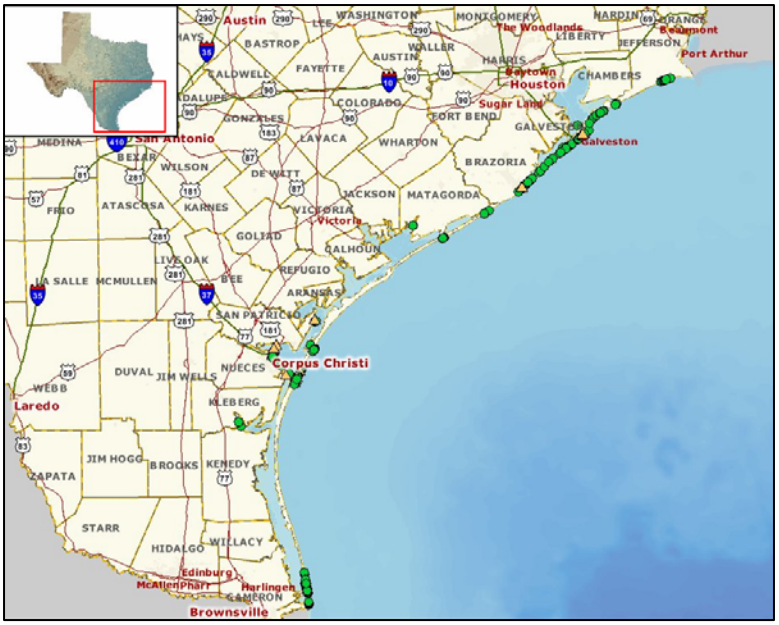

Figure 1. Current Monitoring Beach Watch Sites on the Texas Coast.

When samples indicate that bacteria levels are high enough to warrant an advisory, the water at that beach must be sampled every 24 hours until bacteria levels fall within a safe range. An advisory lasts at least 24 hours, but is extended if bacteria levels continue to exceed recommended levels. The decision to post a beach water quality advisory or beach closure lies with the local health authorities. The public may use a beach under a water quality advisory, as long as local health authorities have not officially closed that beach. However, contact with the water is discouraged until the advisory is cancelled. Advisory information is available to the public via the Texas Beach Watch Interactive Map Tool located on the GLO web site at <http://www.glo.state.tx.us/coastal/beachwatch/>.

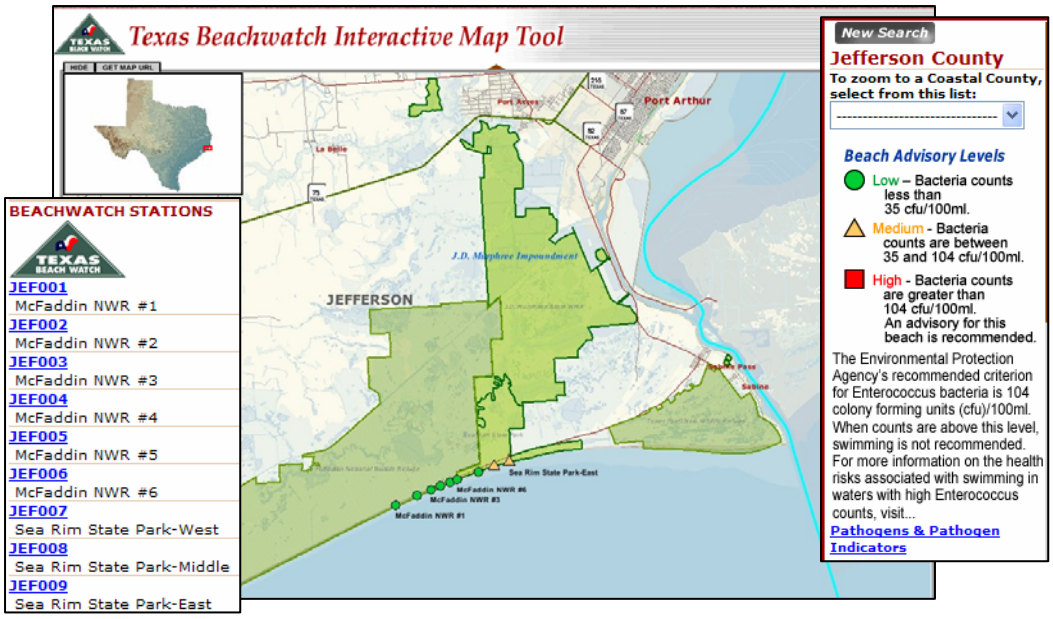

Figure 2. Information Contained on the GLO Texas Beach Watch Interactive Map Tool Web Page.

Assessment of Beach Watch Data

The Beach Watch data collected by GLO partners was used to assess the status of Texas Beaches as part of the Texas Water Quality Inventory. Data was collected at 164 beach sites in nine counties, Jefferson, Galveston, Brazoria, Matagorda, Aransas, San Patricio, Nueces, Kleberg, and Cameron Counties. Data from 2003 to 2006 was downloaded from the EPA STORET database. For the period of record, seven counties had enough data for this assessment. Data for beaches in San Patricio and Kelberg counties were insufficient and not used in this assessment.

This report is a summary of Beach Watch data and is intended to summarize the status of Texas beaches during (April 1 to October 31) and outside (November 1 to March 31) of the swimming season. Data collected on the same day at the same location were averaged into a single value. Data was assessed for each beach station. This information was then compiled into a summary table (Table 1) for "beach areas" by county

Data was summarized for all beaches monitored under the TBWP from 2003 to 2006 based on the "Beach Advisory Levels" of low, medium, and high. The number of samples in the high category should ideally occur less than 25% of the time.

- Low — Bacteria levels are less than 35 colony forming units (cfu).
- Medium — Bacteria levels are between 35 and 104 cfu.
- High — Bacteria levels are > 104 cfu. When bacteria counts are above this level, swimming is not recommended. At this point a "Beach Advisory" is recommended. The posting and duration of a "Beach Advisory" is determined by local health authorities.

The data was also compared to the recreation use annual geometric mean criterion of 35 cfu. The geometric mean is calculated using all data from a monitoring location for the entire period of record. It is notebale that the geometric mean for almost all of the sites is well below this criterion.

Using Beach Watch Data to List a Water Body as Impaired

To list a beach as impaired due to bacteria contamination would require a tiered approach with various levels of evidence considered. This type of approach will be discussed by the stakeholder workgroup for possible use in the 2010 305(b) assessment. New assessment methodologies must have the concurrence of TCEQ management prior to use.

Beach Assessment

Jefferson County

Nine sites were monitored at two beaches in Jefferson County, Sea Rim State Park and McFaddin Wildlife Refuge. A total of 725 samples were collected during the swim season. During the 2003 to 2006 swim seasons the bacteria levels reached the high category nine times (1.2%); eight at McFaddin Wildlife Refuge and once at Sea Rim State Park. See Table 1 and Figure 3. Samples collected during the off season were similar to the data collected during the swim season with <10% of the samples falling into the high category. The percentage of samples in the high category was actually greater in the off season than during

the swim season (see Figure 4). The annual geometric mean calculated for each beach site ranged from 3.4 to 5.9 cfu.

Galveston County

Fifty-one sites were monitored at five beach areas in Galveston County, Galveston Island West Beaches, Seawall Beaches, Texas City Dike, Crystal Beach/Port Bolivar, and Gilchrist Beach. A total of 4,256 samples were collected during the swim season. During the 2003 to 2006 swim seasons the bacteria levels reached the high category a total of 536 times (12.5%). See Table 1 and Figure 5. The majority of samples in the high category occurred during the 2006 swim season with 52% of the samples > 104 cfu, mainly during mid-July. These elevated bacteria levels were associated with storm events. There is no evidence of a chronic source of bacteria. Information from *EPA's Beach Program: 2006 Swimming Season Update* at < http://www.epa.gov/waterscience/beaches/seasons/2006/ >. The annual geometric mean calculated for each beach site ranged from 11.2 to 16.6 cfu.

Brazoria County

Sixteen sites were monitored at two beaches in Brazoria County, Surfside Beach and Follets Island. A total of 1465 samples were collected during the swim season. During the 2003 to 2006 swim seasons the bacteria levels reached the high category 19 times (1.3%). See Table 1 and Figure 7. The annual geometric mean calculated for each beach site ranged from 4.8 to 8.8 cfu.

Matagorda County

Nine sites were monitored at Brazoria County Beaches. A total of 774 samples were collected during the swim season. During the 2003 to 2006 swim seasons the bacteria levels reached the high category 28 times (3.6%). See Table 1 and Figure 9. The annual geometric mean calculated for each beach site ranged from 4.9 to 17.5 cfu.

Aransas County

Four sites were monitored at Aransas County Beaches. A total of 306 samples were collected during the swim season. During the 2003 to 2006 swim seasons the bacteria levels reached the high category 36 times (11.8%). See Table 1 and Figure 11. The annual geometric mean calculated for each beach site ranged from 9.9 to 18.3 cfu.

Nueces County

Forty-four sites were monitored at eight beach areas in Nueces County, Port Aransas, Mustang Island, JP Luby Park, Bob Hall Pier/Seawall, Upper Corpus Christi Bay, Corpus Christi Marina, Corpus Christi Bay-Urban, and Upper Laguna Madre. A total of 3,462 samples were collected during the swim season. During the 2003 to 2006 swim seasons the bacteria levels reached the high category 409 times (11.8%). See Table 1 and Figure 13. The bacteria levels reaching the high category at individual monitoring sites were roughly the same ranging from two to eight times during the swim season.

The exception to this occurred at beaches in the Corpus Christi Bay Urban area. A total of 1,024 samples were collected at 10 beach sites during the 2003-2006 swim season. The bacteria levels reaching the high category at individual monitoring sites ranged from seven to 44 times during the 2003-2006 swim season. Four specific beaches had the highest bacteria

levels during the swim season; Cole Park #3, Cole Park #4, Ropes Park #2, and Ropes Park #3. Of the 261samples falling in the high category for Corpus Christi Urban sites, 156 (59.8%) occurred at these four beaches. This situation also occurred during the off season with 52.6% (60 of 114) of the samples falling in the high category (see Table 1 and Figure14).

The annual geometric means calculated for each beach site in Nueces County ranged from 3.2 to 60.7 cfu. The geometric mean for the Corpus Christi Bay Urban sites ranged from 12.6 to 60.7 cfu. All other beaches in Nueces County had geometric means ranging from 3.2 to 14.6 cfu.

Cameron County

Twenty-six sites were monitored at three beach areas in Cameron County, Boca Chica, South Padre Island (SPI)-developed area, and SPI-undeveloped area. A total of 2001 samples were collected during the swim season. During the 2003 to 2006 swim seasons the bacteria levels reached the high category 43 times (2.1%). See Table 1 and Figure 15. The annual geometric mean calculated for each beach site ranged from 1.6 to 4.3 cfu.

Summary

As part of the Texas Beach Watch Program, a total of 13,061 Enterococcus samples were collected at 159 locations in seven counties along the Texas coast during the 2003-2006 swimming seasons. At the same locations an additional 5,235 Enterococcus samples were collected during the off season. The areas with the most urban influence had the highest number of bacteria levels reaching the high category, Galveston and Nueces Counties. During the combined swimming seasons from 2003 to 2006 the bacteria levels in the high category occurred less than 25% of the time at all locations along the coast with one exception. The exception occurred at the beaches along the heavily urbanized portion of Corpus Christi Bay. The annual geometric mean (59.2 cfu) was greater than 35 cfu at five of the ten beaches in this area. Stormwater control measures in this type of urban setting would be required to ensure safety for local swimmers. This will present a challenge to local officials and TCEQ as the regulatory entity.

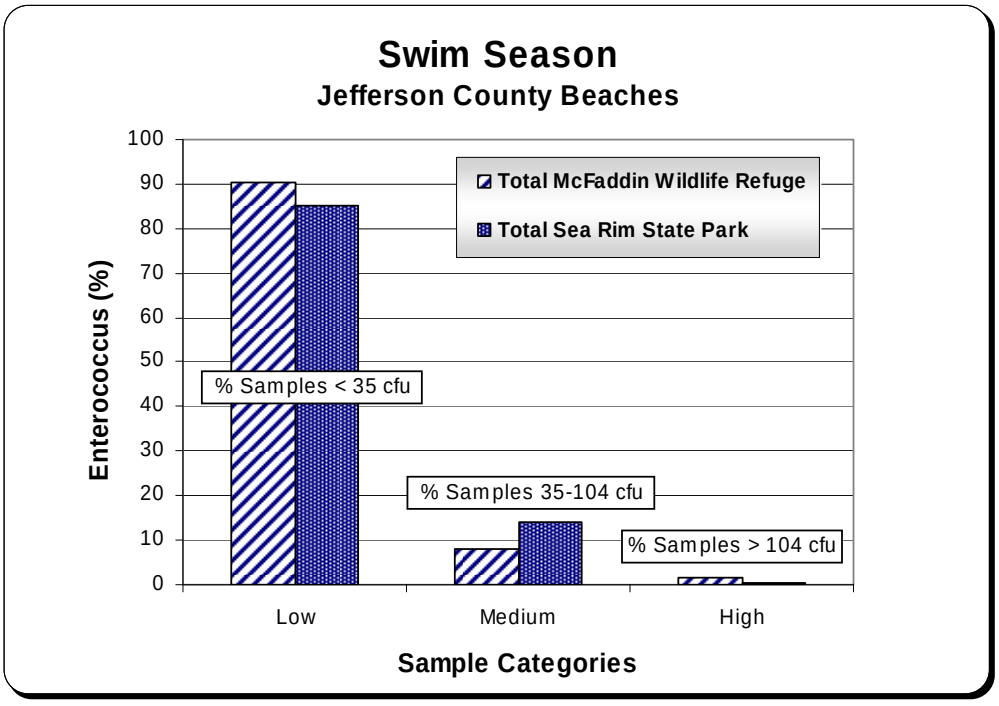

Figure 3. Swim Season Enterococcus Data, 2003-2006, Jefferson County Beaches (percent of total samples).

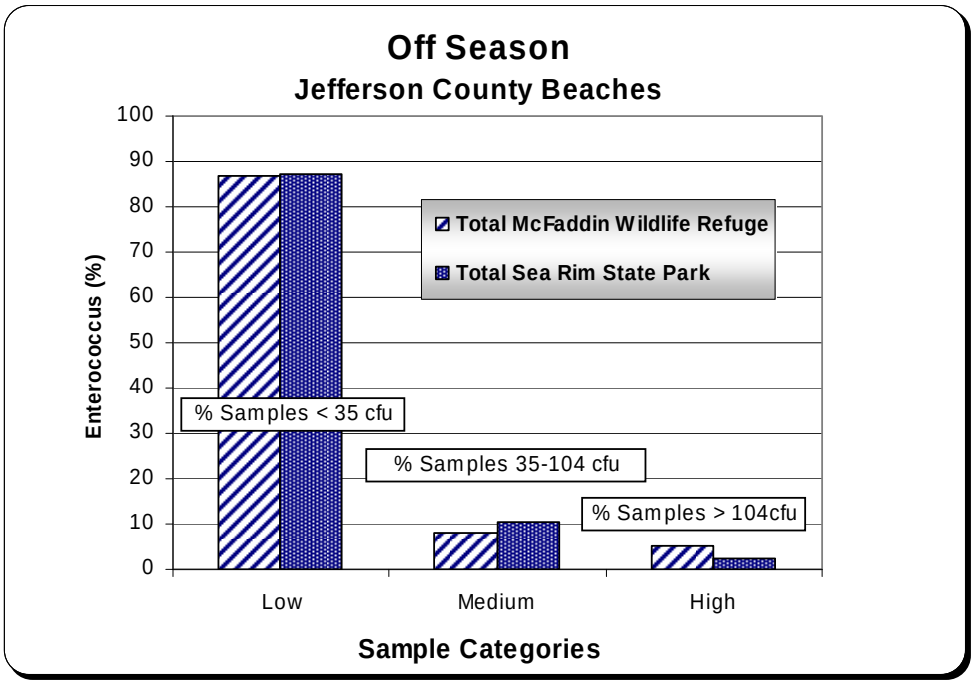

Figure 4. Off-Season Enterococcus Data, 2003-2006, Jefferson County Beaches (percent of total samples).

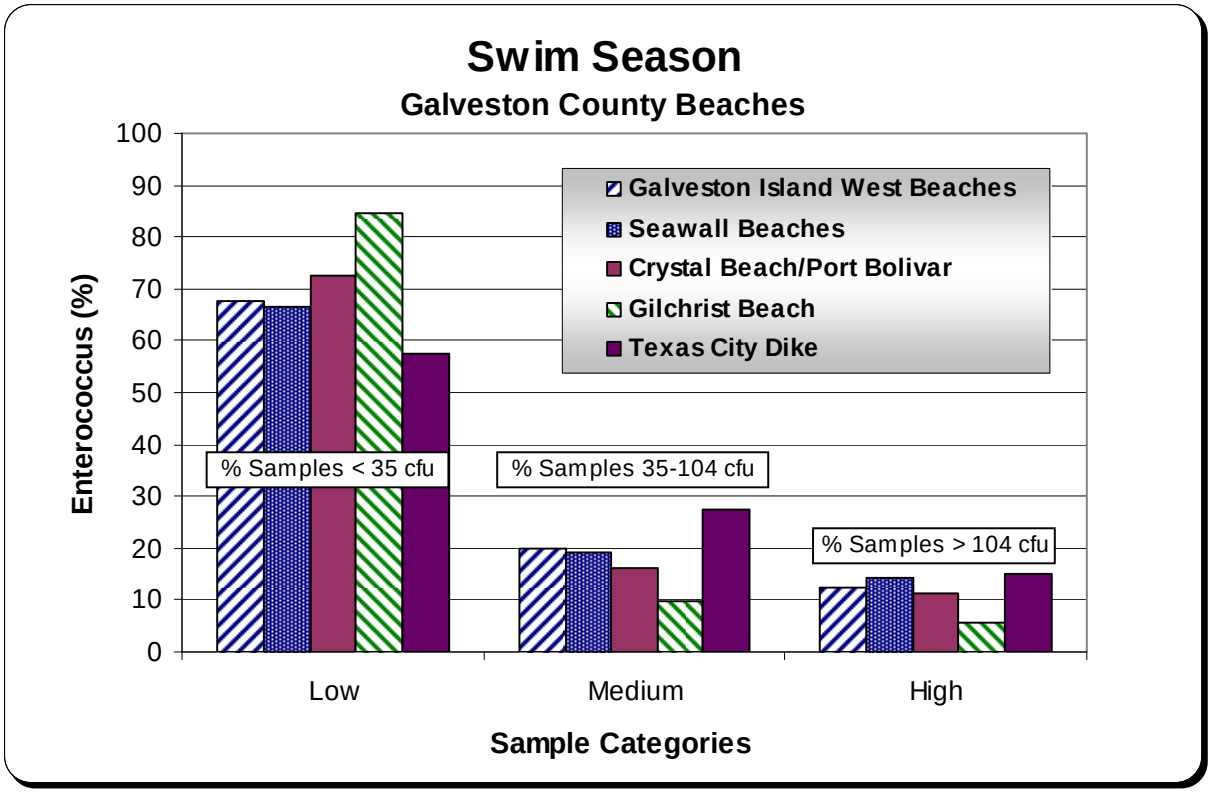

Figure 5. Swim Season Enterococcus Data, 2003-2006, Galveston County Beaches (percent of total samples).

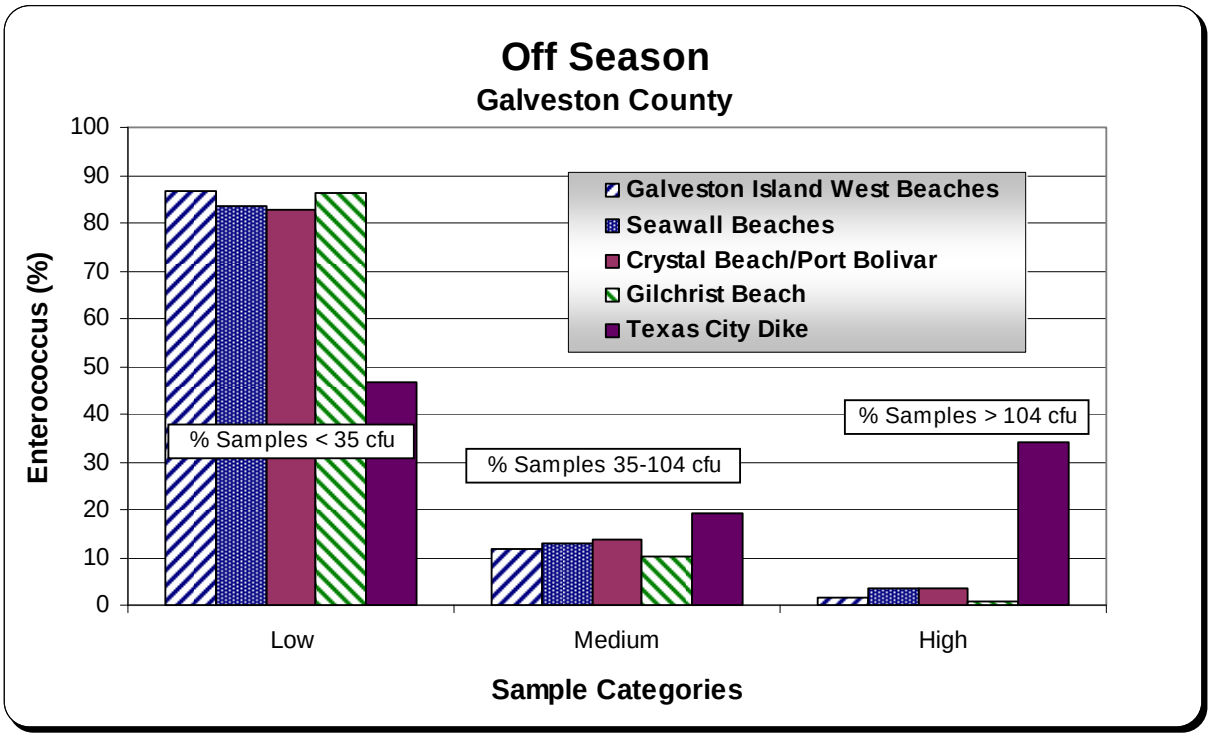

Figure 6. Off Season Enterococcus Data, 2003-2006, Galveston County Beaches (percent of total samples).

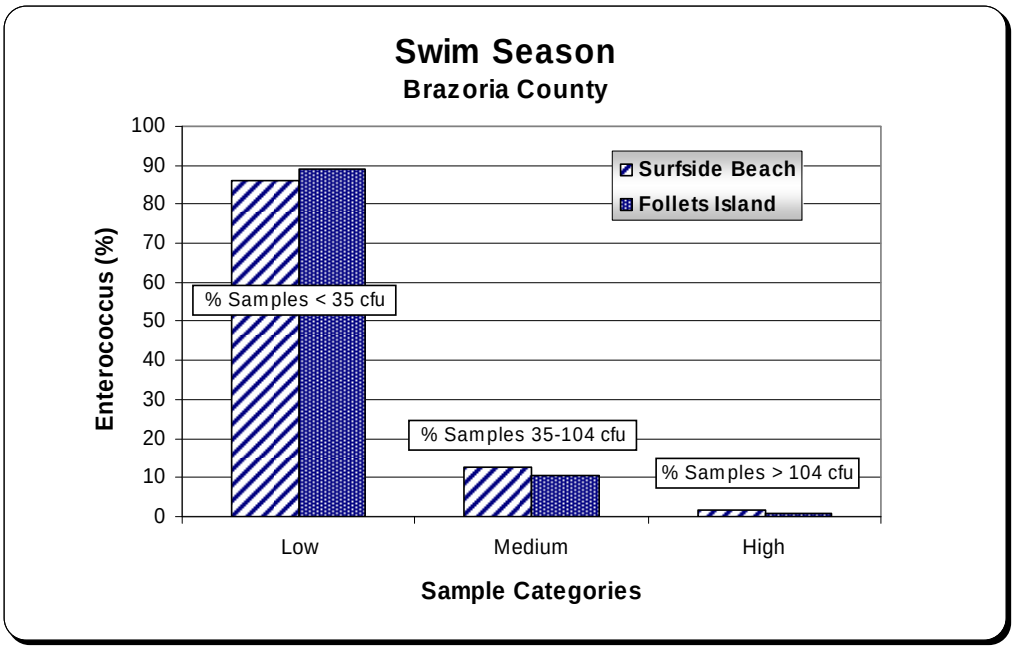

Figure 7. Swim Season Enterococcus Data, 2003-2006, Brazoria County Beaches (percent of total samples).

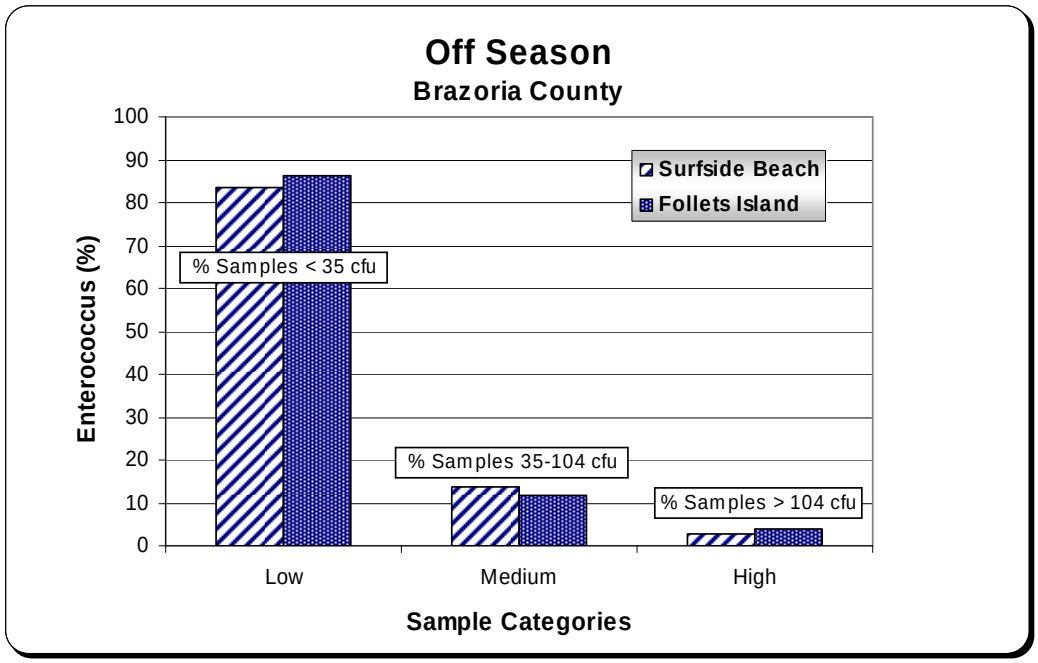

Figure 8. Off Season Enterococcus Data, 2003-2006, Brazoria County Beaches (percent of total samples).

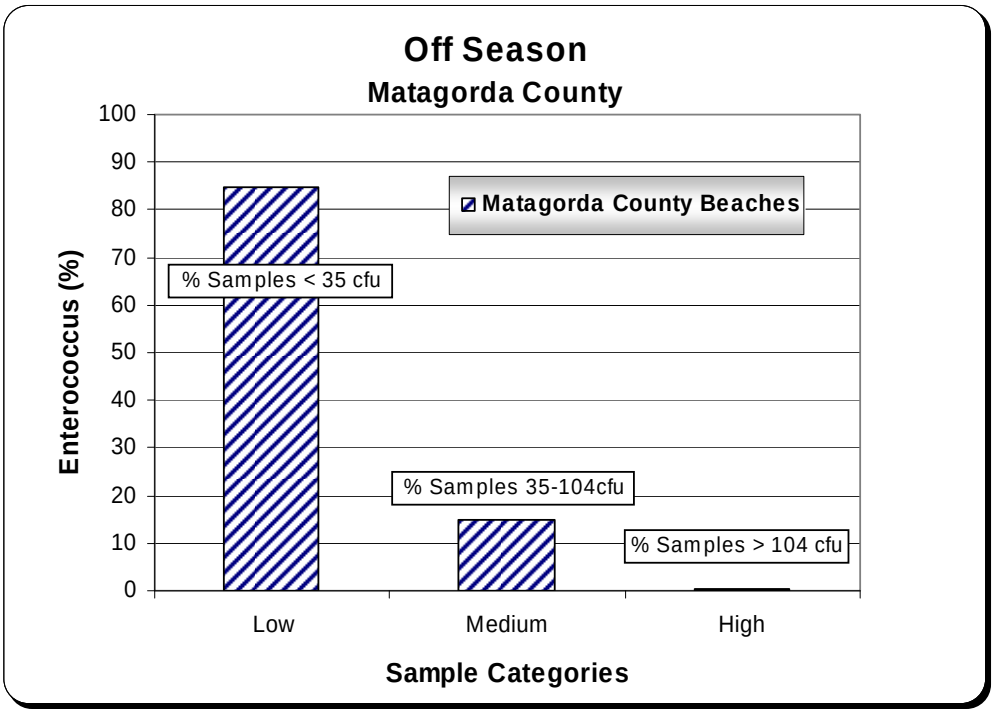

Figure 9. Swim Season Enterococcus Data, 2003-2006, Matagorda County Beaches (percent of total samples).

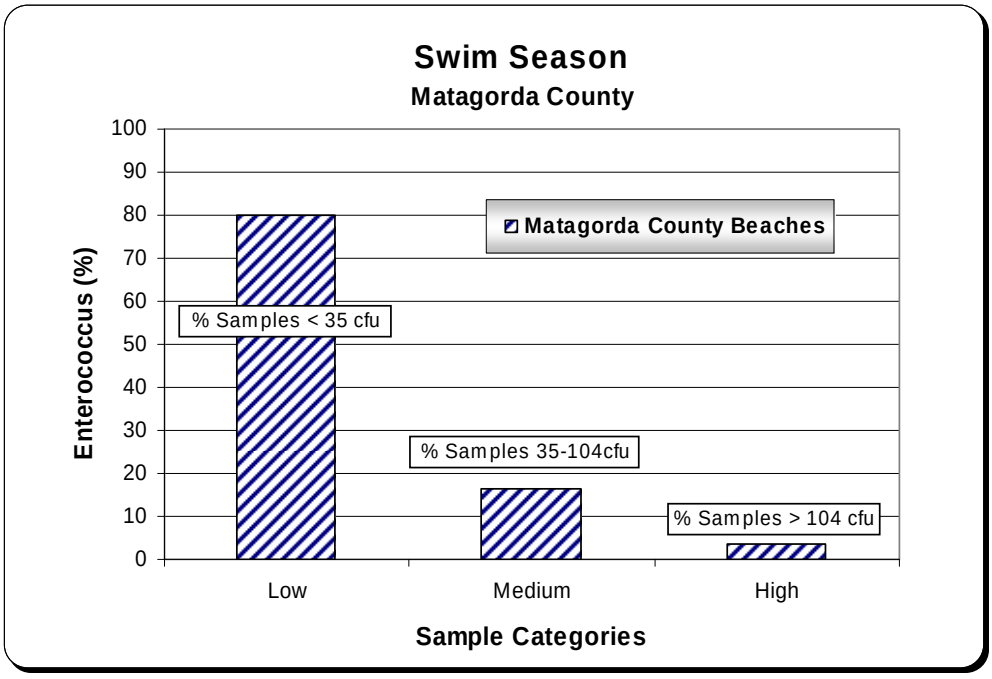

Figure 10. Off Season Enterococcus Data, 2003-2006, Matagorda County Beaches (percent of total samples).

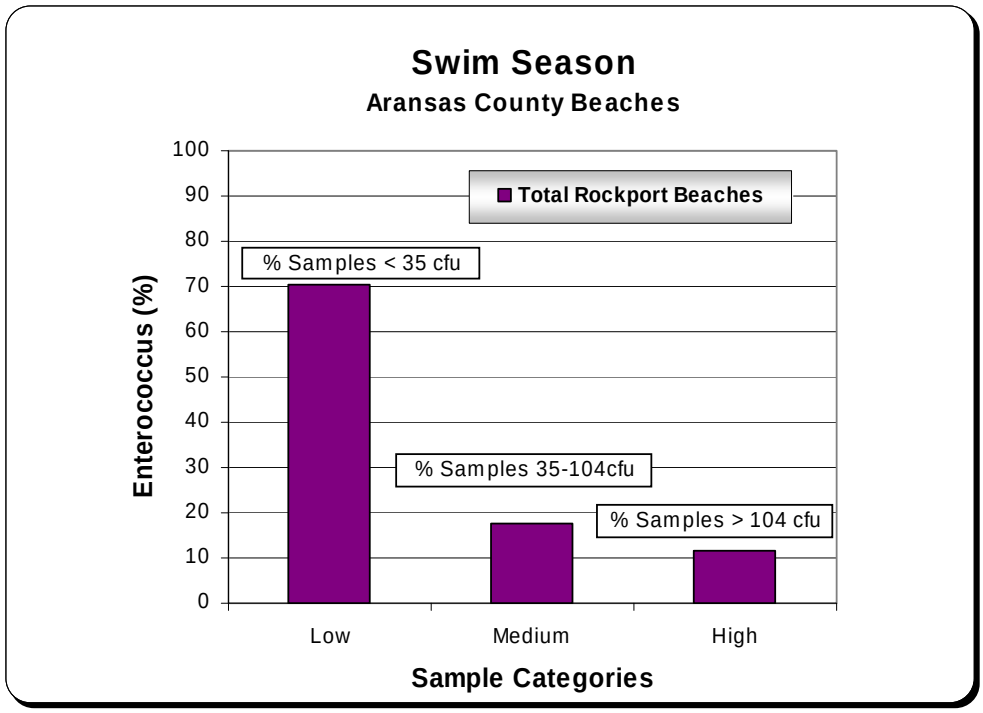

Figure 11. Swim Season Enterococcus Data, 2003-2006, Aransas County Beaches (percent of total samples).

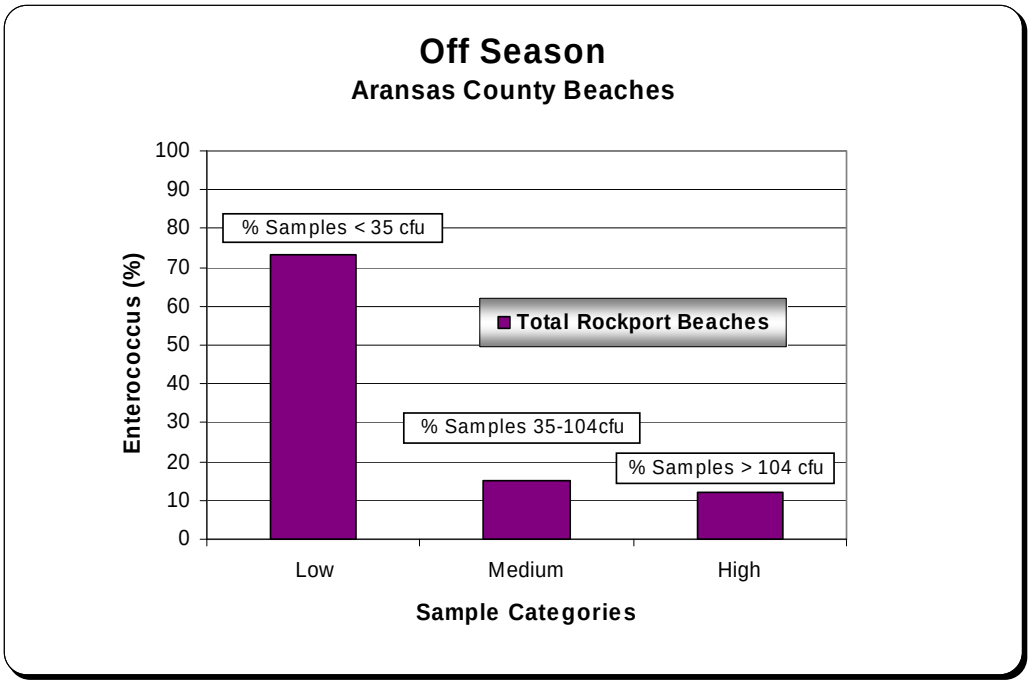

Figure 12. Off Season Enterococcus Data, 2003-2006, Aransas County Beaches (percent of total samples).

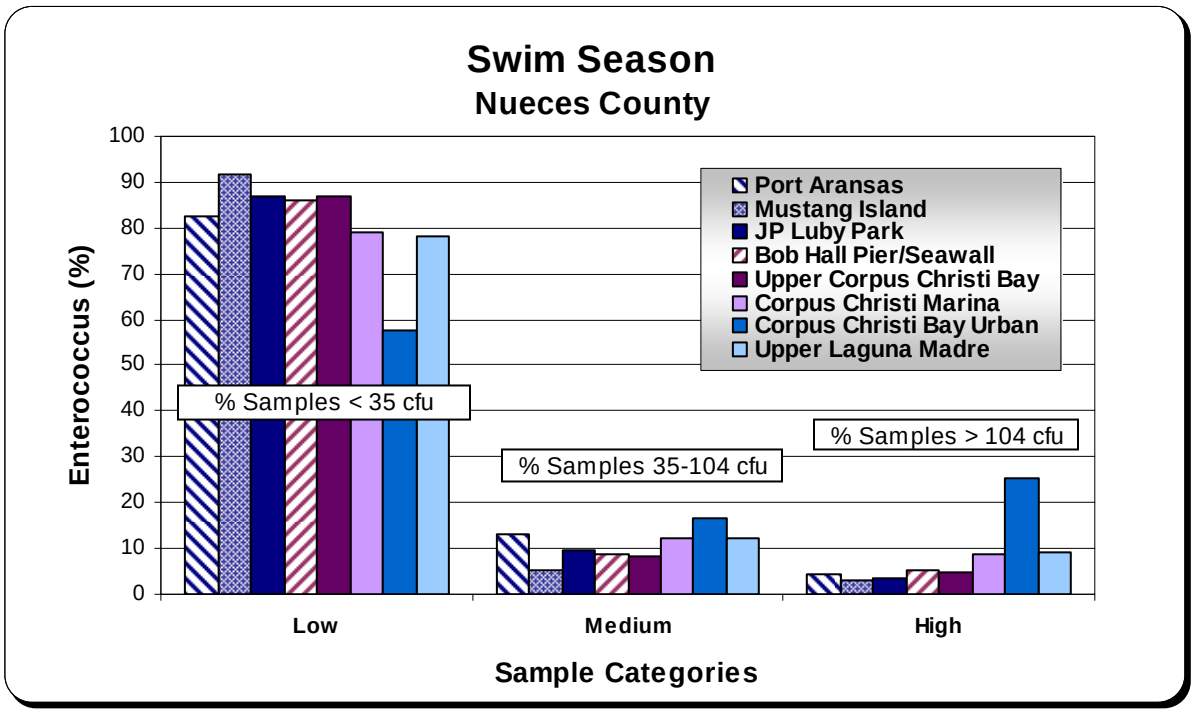

Figure 13. Swim Season Enterococcus Data, 2003-2006, Nueces County Beaches (percent of total samples).

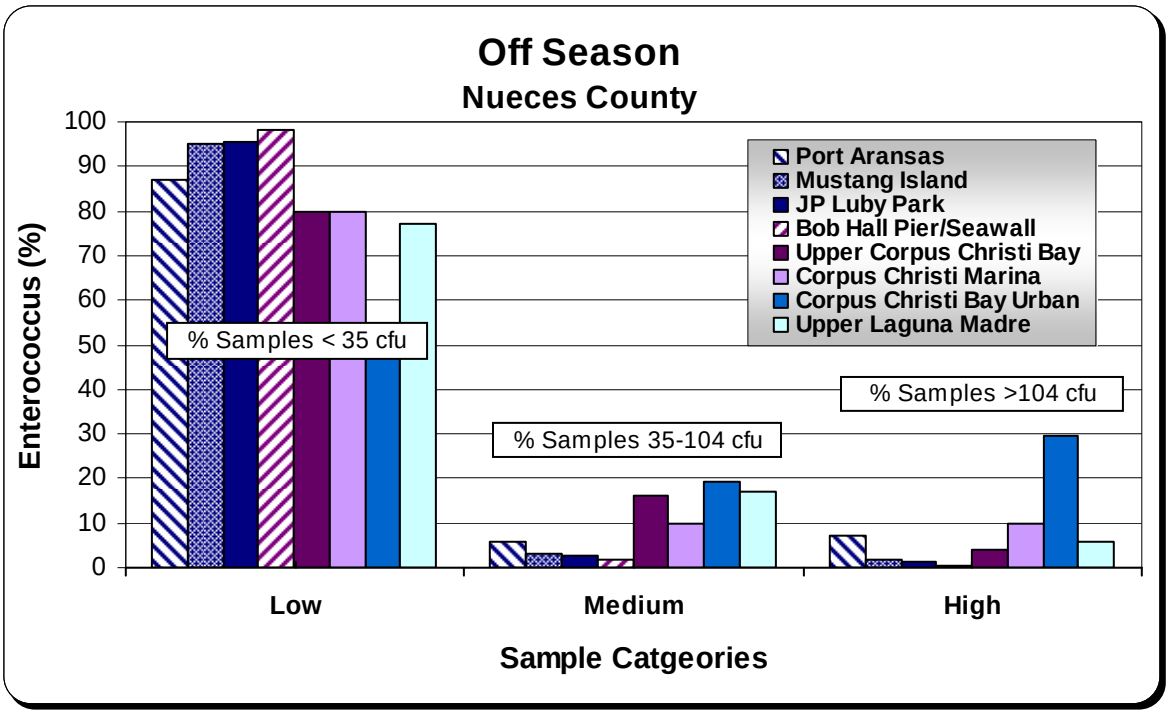

Figure 14. Off Season Enterococcus Data, 2003-2006, Nueces County Beaches (percent of total samples).

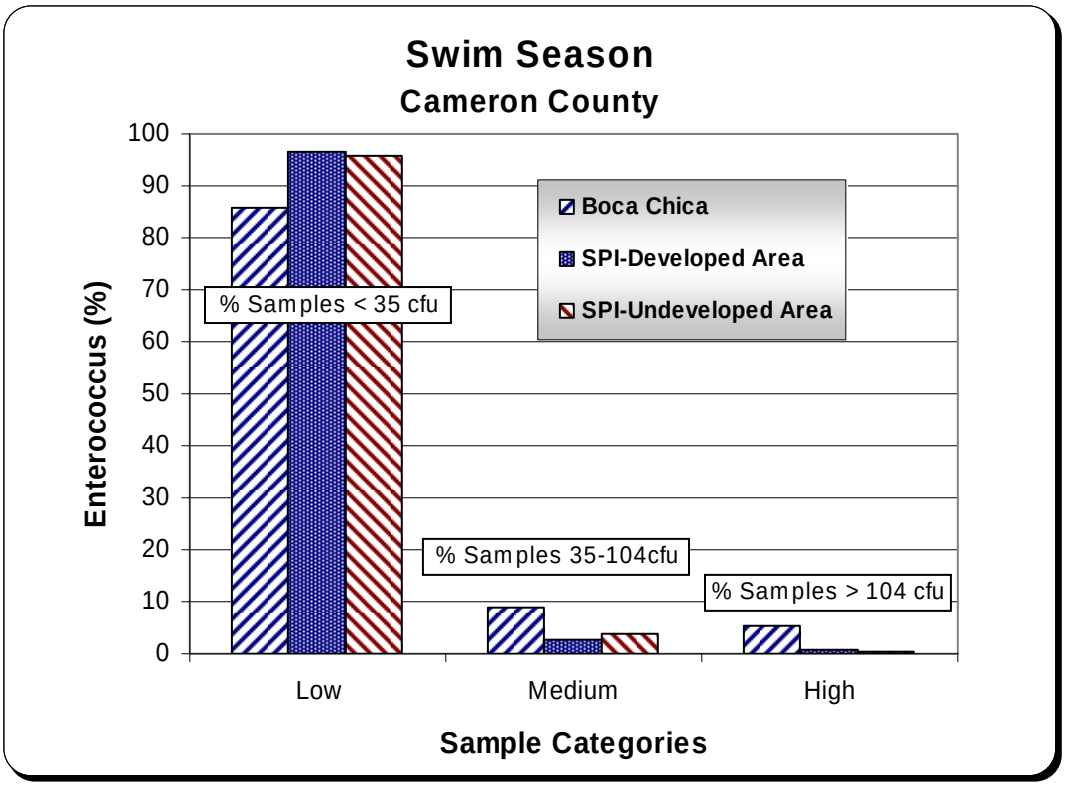

Figure 15. Swim Season Enterococcus Data, 2003-2006, Cameron County Beaches (percent of total samples).

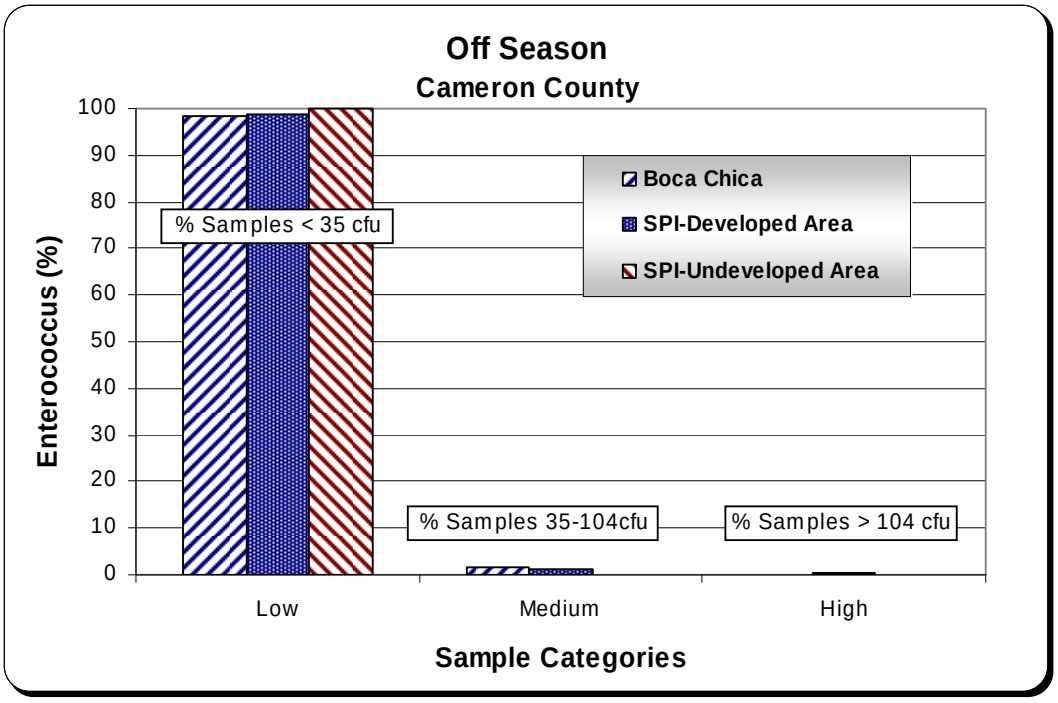

Figure 16. Off Season Enterococcus Data, 2003-2006, Cameron County Beaches (percent of total samples).

Table 1. Summary of Beach Watch Data, 2003-2006, Jefferson, Galveston, Brazoria, Matagorda, San Patricio, Aransas, Nueces, Kleberg, and Cameron Counties.

Sampling Locations	Number of Beaches	Swim Season				Off Season				Annual Geomean
Jefferson County		**Low**	**Medium**	**High**	**Total***	**Low**	**Medium**	**High**	**Total ***	
McFaddin Wildlife Refuge	**6**	482	44	8	534	164	15	10	189	3.9
Sea Rim State Park	**3**	163	27	1	191	75	9	2	86	4.9
Total Jefferson County	**9**	**645**	**71**	**9**	**725**	**239**	**24**	**12**	**275**	**4.3**
Galveston County		**Low**	**Medium**	**High**	**Total ***	**Low**	**Medium**	**High**	**Total ***	**Annual Geomean**
Galveston Island West Beaches	**18**	989	290	182	1461	498	68	10	576	13.2
Seawall Beaches	**18**	981	281	211	1473	433	67	19	519	19.3
Crystal Beach/Port Bolivar	**11**	682	152	105	940	315	53	13	381	12.3
Gilchrist Beach	**3**	197	23	13	233	94	11	4	109	7.7
Texas City Dike	**1**	46	22	12	80	22	9	16	47	26.9
Total Galveston County	**51**	**2943**	**779**	**534**	**4256**	**1392**	**212**	**63**	**1667**	**14.5**
Brazoria County		**Low**	**Medium**	**High**	**Total ***	**Low**	**Medium**	**High**	**Total ***	**Annual Geomean**
Surfside Beach	**11**	903	132	16	1051	324	54	10	388	6.3
Follets Island	**5**	368	43	3	414	132	18	6	153	5.3
Total Brazoria County	**16**	**1271**	**175**	**19**	**1465**	**456**	**72**	**16**	**544**	**5.7**
Matagorda County		**Low**	**Medium**	**High**	**Total ***	**Low**	**Medium**	**High**	**Total ***	**Annual Geomean**
Matagorda County Beaches	**9**	620	126	28	774	244	43	1	288	
Total Matagorda County	**9**	**620**	**126**	**28**	**774**	**244**	**43**	**1**	**288**	**6.9**

Table 1. Summary of Beach Watch Data, 2003-2006, Jefferson, Galveston, Brazoria, Matagorda, San Patricio, Aransas, Nueces, Kleberg, and Cameron Counties.

Aransas County	Number of Beaches	Low	Medium	High	Total *	Low	Medium	High	Total *	Annual Geomean
Rockport Beaches	**4**	216	54	36	306	74	15	12	101	
Total Aransas County	**4**	**216**	**54**	**36**	**306**	**74**	**15**	**12**	**101**	**13**

Nueces County	Number of Beaches	Low	Medium	High	Total *	Low	Medium	High	Total *	Annual Geomean
Port Aransas	**6**	398	62	21	481	210	14	17	241	8
Mustang Island	**6**	416	23	14	453	190	6	4	200	4
JP Luby Park	**4**	268	30	10	308	133	4	2	139	5.3
Bob Hall Pier/Seawall	**8**	540	56	32	628	310	5	1	316	5.7
Upper Corpus Christi Bay	**4**	279	27	15	321	100	20	5	125	10.1
Corpus Christi Marina	**3**	45	5	4	54	12	0	1	13	6.9
Corpus Christi Bay Urban	**10**	591	172	261	1024	215	77	114	406	27.4
Upper Laguna Madre	**3**	151	24	18	193	64	14	5	83	6.8
Total Nueces County	**44**	**2688**	**399**	**375**	**3462**	**1234**	**140**	**149**	**1523**	**7.7**

Cameron County	Number of Beaches	Low	Medium	High	Total *	Low	Medium	High	Total *	Annual Geomean
Boca Chica	**6**	514	53	32	599	201	3	0	204	3.9
SPI-Developed Area	**11**	815	22	8	845	369	4	1	374	2.1
SPI-Undeveloped Area	**9**	605	24	3	632	253	2	2	257	2.9
Total Cameron County	**26**	**1934**	**99**	**43**	**2076**	**823**	**9**	**3**	**835**	**2.7**
Total Texas Beaches	**159**	**10317**	**1703**	**1044**	**13064**	**4462**	**515**	**256**	**5233**	**6.8**

***** Total number of samples. For this assessment samples collected on the same day were averaged to represent a single event.