

# Status Report: TDC Captiva Water Quality Assessment Project Funded through the Captiva Community Panel (CCP)

*SCCF Marine Lab, for September 11, 2009 TDC Meeting*

## Project Overview

- *Year 1: General analysis of water quality*
  - *Sampling is driven by rainfall and tides -- just like pollutants. More rain = more 'pollution'*
  - *Exceptionally dry year may not reflect some water quality issues caused by runoff.*
  - *Blind Pass opening will significantly change water quality in Sound and along shore*
- *Year 2: Focuses on problems found in Year 1*
  - *Year 2 monitoring will allow us to focus on pollution causes and more accurately document water quality issues for the island's dynamic coastline*
  - *Important to compliment year 1 with additional rain event work in year 2*

## Project Background and Objectives

The overall aims of the Captiva WQ Assessment Project are to: (1) summarize historical regional water quality data; (2) characterize current near-shore water quality around Captiva Island during wet and dry seasons and low and high population periods using sentinel, storm event and beach sampling approaches; (3) identify possible problem pollutants and areas; and (4) use several approaches to track identified problems to the source(s). The project was designed to accomplish these goals over a two year period. During this time frame the Bayous sewage treatment plant on Sanibel was closed and filled in and Blind Pass was reopened (late August 2009), potentially changing flows and inputs as measured in year 1. Given on Captiva, most residences are on septic, while larger commercial enterprises operate relatively small water treatment plants, our sampling and related efforts were specifically tailored to these "boundary conditions".

In the first year we are: (a) collecting and analyzing all existing local water quality data; (b) developing a water quality monitoring program intended to help determine if there are water quality concerns and the general areas with issues of concern; (c) and analyzing all related monitoring data funded by the TDC and other related projects to design ultimately a source tracking protocol which will be emphasized in the second year of the two year project.

In the second year of the study, monitoring will be concentrated on a subset of areas and on pollutants identified as problematic in year 1 of the study using the latest methods possible to track pollutants to their sources. We will also continue to sample a limited number of areas which did not have elevated pollutant levels in year 1 as 'controls'.

## Accomplishments to Date

During the first year of this study, we collected and combined all existing water quality data for the study area into a Geodatabase (> 500,000 records). We analyzed these existing data and determined: (1) where data gaps exist; (2) what pollutant parameters are of greatest concern; and (3) where potential pollution problems may be occurring, especially nearshore. Next, using this information, we developed a water quality monitoring plan with three major elements: (A) collection of water quality data for **six** major storm events, **three** in the dry (November-April) and **three** in the wet (May-October) seasons at **22** previously selected 'storm event' sites (see Figure 1); (B) collection

of water quality data at **nine** ‘sentinel’ sites chosen based upon identified potential pollution sources during our review of historical data and existing facilities in the area. These sites have been or will be sampled during late ‘spring’ (moon is full or new with tides very high or very low), ebb (falling) tide ‘events’ in an effort to maximize the influence of nearshore pollution sources); and (C) collection of bacteriological samples at **four** beach sites, analyzing nearshore water, interstitial water and sands for Fecal Indicator Bacteria (FIBs). Monitoring of these sites for bacteria, nutrients, salinity, dissolved oxygen, water clarity and algae has produced data that will be analyzed to determine if problems do exist (see Figure 2).

It is important to note that the timing of our sampling events with tides and rainfall is critical to the success of this project’s two year overall goals and why the bulk of our sampling for year One occurs during April-October 2009, when appropriate tides and significant rainfall events occur. Historically greater pollutant concentrations occur during these wetter months when island visitors are significantly lower.

To date we have collected about 78% of the samples called for in our year 1 monitoring plan (see Table 1). The data collected in year 1 (by the end of October 2009) will not be sufficient by themselves to determine “in a scientifically defensible manner”, what problems occur only periodically and where the specific sources of these “problems” stem from, but rather year 1 provides an overall characterization of water quality around Captiva and adjacent areas to determine if specific areas or sources exist that need to be looked at in more detail in year 2, the second phase of the project. By the end of the first year of this project (Oct 2009) we will have enough information to adapt our current monitoring effort to a more problem-focused approach.

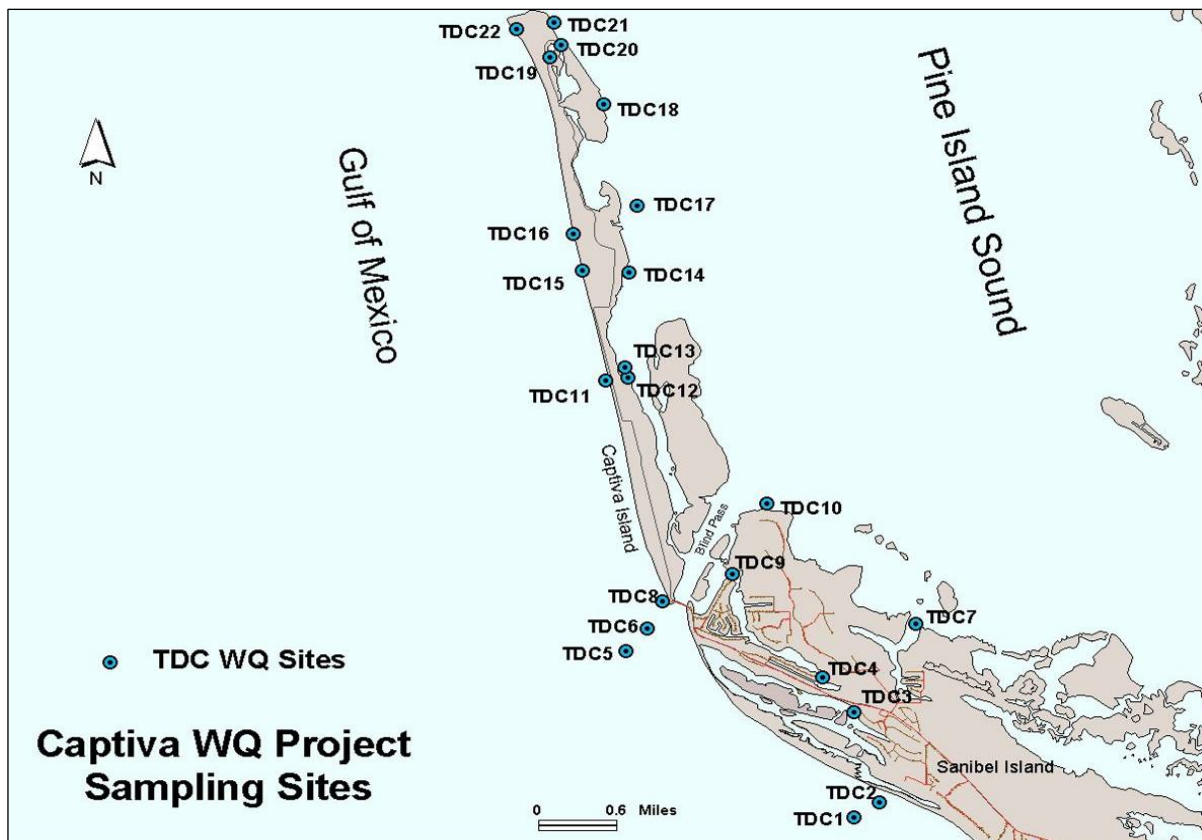
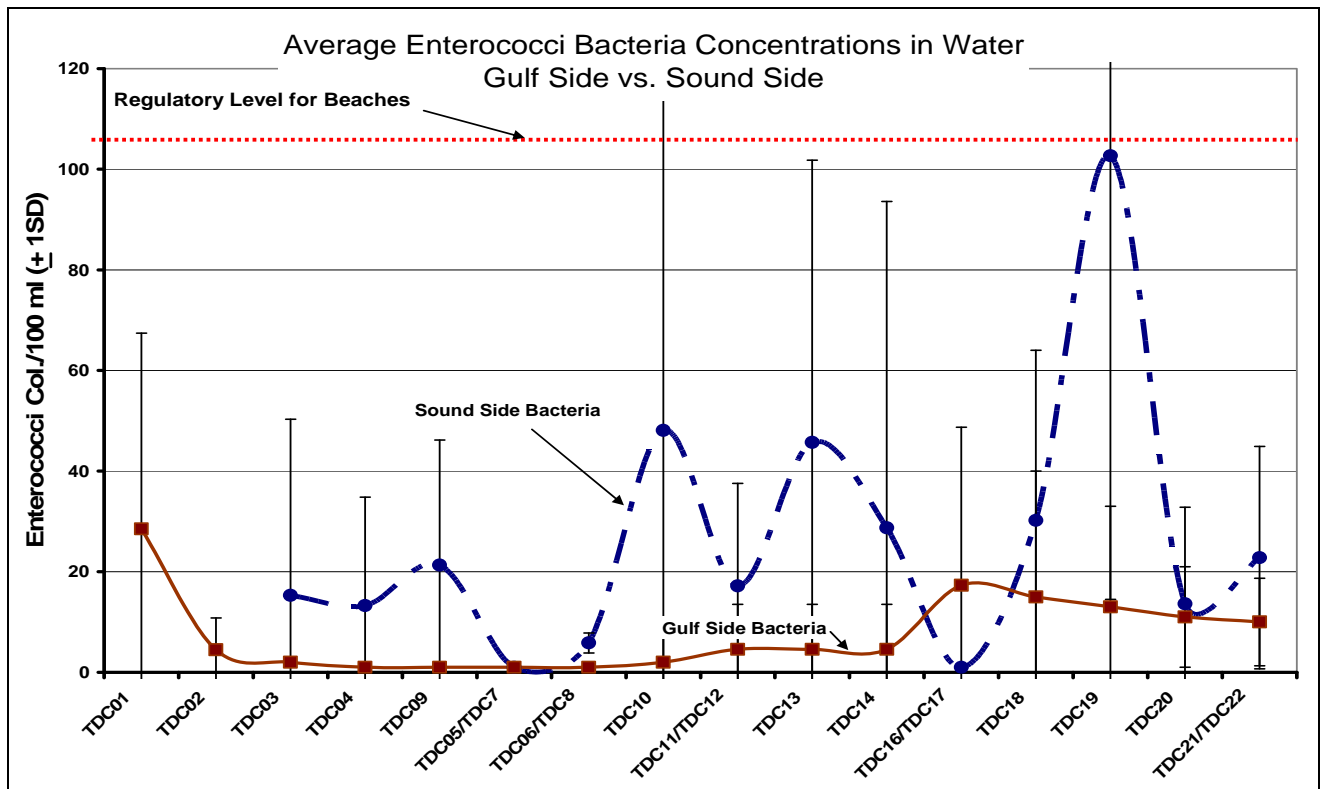


Figure 1: Water Quality Monitoring Sites for the TDC project.

**Table 1: Water quality monitoring information for events in first year of Captiva Water Quality Assessment project.**

Sampling Date	Day	Time	Event Type	Number of sites sampled	Number of analyses completed	Lab Costs	Note
11/17/2008	Monday	7:30	Sentinel Site	8	114	445	
11/25/2008	Tuesday	3:00	Beach Study	3	37	200	
12/1/2008	Monday	8:00	Storm Event	6	89	623	
12/12/2008	Thursday	8:00	Beach Study	4	46	1908	
12/12/2008	Friday	8:00	Storm Event	16	200	incl above	
2/9/2009	Monday	10:00	Sentinel Site	10	147	1099	
4/23/2009	Thursday	15:00	Beach Study	4	63	300	
4/27/2009	Monday	8:00	Sentinel Site	8	139	1197	
5/19/2009	Tuesday		Storm Event	25	433	2403	
6/4/2009	Thursday	15:00	Beach Study	4	71	140	
6/21/2009	Sunday	8:00	Sentinel Site	8	142	801	
6/30/2009	Tuesday	7:00	Storm Event	21	370	2403	
7/16/2009	Thursday	11:30	Sentinel Site	8	128	621	
7/23/2009	Thursday	6:30	Beach Study	3	37	70	
7/23/2009	Thursday	6:30	Sentinel Site	10	100	190	
8/20/2009	Thursday	8:00	Storm Event	10	130	800	Cost est
9/9/2009	Wednesday	8:30	Sentinel Site	8	145	800	Cost est
9/10/2009	Thursday	11:00	Beach Study	3	35	260	Cost est
9/25/2009	Estimated Date		Storm Event	25	400	2400	Cost est
10/7/2009	Wednesday	10:30	Beach Study	3	35	260	Cost est
<b>Total</b>				<b>187</b>	<b>2861</b>	<b>16920</b>	



**Figure 2: Example mean bacteriological conditions found at sites studied during this project.**

## Discussion

Nearshore water quality is dependent upon a number of factors including land use characteristics of watershed, precipitation, influence of tidal exchange, and potential pollution sources. This project initially is attempting to establish an overall 'general condition' of nearshore 'water quality' around Captiva Island and adjacent areas initially in year one. To estimate general water quality conditions during wet and dry seasons, optimal conditions would include a wide range of rainfall (precipitation) events in both wet and dry season during the study period.

In year one of the study, dry season total precipitation was well below normal, with only a few storm events greater than 0.5 inches. As a result, this period of study was less than ideal for understanding recent problems which may be caused by issues associated with stormwater runoff. Conditions as documented by other efforts (Drift Algae Project or RECON) were better than they had been in the not too distant past when beach closures or advisories and Drift Algae 'Bloom' events were occurring.

During our year 1 sampling, the rainfall during the normal rainy season was below average until August 2009. Only just recently were we able to sample larger rain events which may have greater influence on nearshore water quality. With the increase in stormwater runoff greater concentrations of bacteria are being found during beach monitoring by Florida Department of Health with several area beaches showing moderate to poor bacteria water quality in August and September. In addition, the opening of Blind Pass on August 1, 2009 is now producing greater tidal flushing in the area of study (see Figure 3). Gulf water is generally of higher quality (lower pollutant concentrations), so the Pass's opening will likely affect monitoring results in the wet season.

One of the primary pollutants of concern is bacteriological concentrations associated with fecal 'origins'. In past years, several beach closings occurred in the area due to concentrations of Fecal Indicator Bacteria (FIB's) greater than state regulatory requirements (see summary of all Florida beaches (see Dorfman and Rosselot (2009 or downloadable at <http://www.nrdc.org/water/oceans/ttw/ttw2009.pdf>). Additionally, the Bayous wastewater treatment facility on northern Sanibel Island was often suspected as a possible source of bacteria which may have caused beach closings. The facility was closed in May 2008 and the full wastewater treatment pond was filled with sand by the end of July 2009 (see below Figure 4). The closing of this facility may have eliminated one historical source of bacterial contamination in that area.

In summary the nearshore water quality surrounding Captiva Island is dynamic and subject to many natural and anthropogenic influences. This study will attempt to derive some general conclusions from the short snapshot of time over which the study was conducted. We hope this study will provide significant additional information useful to understanding the major factors which influence water quality in this area.

## Relevant Literature

Dorfman, M., and K.S. Rosselot, 2009. Testing the waters: A guide to water quality at vacation beaches, 19<sup>th</sup> edition, Natural Resources Defense Council, 453pp.

Figure 3. Before (A) and after (B) opening of Blind Pass. Note the color of the bottom image's (C) water (see red arrows) prior to the opening and free entry of Gulf of Mexico water into the Pass towards Pine Island Sound. Color difference between B and C shows change.



Figure 4. Former Bayous wastewater treatment facility's perk pond, before closure (top image, 2004 or 2005) and after closure and filling (bottom image, August 2009). Treatment plant also shown on right of pond (upper image) and after demolition left of lower two images.

