

**ASSATEAGUE ISLAND NATIONAL
SEASHORE**

**BAYSIDE WATER CONTACT RECREATION
2006 SITE SURVEY REPORT**



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Abstract

For the past 16 years the Natural Resource Management Staff of Assateague Island National Seashore (ASIS) in cooperation with state and local agencies has been monitoring the seaside beach waters of Assateague Island for the presence of harmful bacteria. In recent years concerns have been raised regarding the use of other areas of the National Seashore for water contact related activities and the level of safety that is being provided for the participants of these activities. The beach adjacent to the Bayside Campground, Old Ferry Landing, and the bayside beach associated with Little Tom's Cove have been identified as areas of concern. These areas have become popular for families seeking the calmer, warmer waters of the Bay and are often used as sites for Park sponsored water contact activities such as seining and clamming. National Park Service staff monitored bacterial indicators of fecal contamination at these three bayside recreation areas from May 22nd to September 5th 2006 using established sample collection procedures from the ASIS Beach Water Quality Monitoring Program.

Introduction

Water contact recreational activities in marine waters contaminated with human fecal material can result in gastroenteritis and other related illnesses, with viruses being the most probable causal agent. As coastal development increases adjacent to Assateague Island so increases the risks to public health from the discharge of untreated or inadequately treated sanitary wastes.

The "Beaches Environmental Assessment and Coastal Health (BEACH) Act" of 2000 amended section 303 of the Federal Water Pollution Control Act by specifying monitoring and reporting requirements for pathogens and pathogen indicators in coastal recreation waters for the purpose of protecting public health and welfare. The Environmental Protection Agency (EPA) has classified activities that involve water exposures as either primary or secondary contact recreation. Primary contact recreation usually includes swimming, skin-diving, surfing, and other activities likely to result in immersion. Secondary contact recreation involves activities where immersion is unlikely such as boating, and wading. (40 CFR 131.10a, 2.1.3 Recreation) As a result of the BEACH Act the State of Maryland (MD) and the Commonwealth of Virginia (VA) adopted guidelines based on EPA recommendations for their respective water quality standards. Although protocols differ slightly both Maryland and Virginia have established numeric standards for water contact recreation.

The State of MD has designated primary contact recreation uses for all recreational waters and has set primary contact bacteriological criteria based upon its frequency of use.

For marine waters the single sample maximum allowable density of enterococcus bacteria per 100ml of sample for frequent full body contact = 104, moderately frequent full body contact = 158, occasional full body contact = 275 and infrequent full body contact = 500. The maximum allowable geometric mean density of five single samples

taken at a site over a 30 day period remains 35 colonies/100 ml regardless of its frequency of use. (MD Reg 26.08.02.03-3 Designated Uses)

Frequency of Use Marine Waters	Single Sample Max	Geometric Mean Max
Frequent Full Body Contact Recreation	104	35
Moderately Frequent Full Body Contact Recreation	158	35
Occasional Full Body Contact Recreation	275	35
Infrequent Full Body Contact Recreation	500	35

The Maryland Department of the Environment (MDE) has delegated the authority to define specific frequency of use categories to the counties or other agencies conducting the monitoring programs. However, there is currently very little guidance for defining frequency of use categories. There are also no clear definitions of frequent, moderate, occasional, or infrequent. Worcester County as well as Assateague Island National Seashore (ASIS) have adopted guidelines that match frequency of use category Frequent Full Body Contact Recreation to represent life-guarded ocean beaches. Worcester County and ASIS have adopted guidelines that match frequency of use category Moderately Frequent Full Body Contact Recreation to represent non life-guarded ocean beaches. (NPS 1992) The MDE intends that use of single sample maximum allowable density to be used as a tool for informing the public of the current status of an area and not as a means to define whether that area is appropriate for primary contact recreation. The MDE relies primarily upon the geometric mean maximum allowable density to decide whether an area can be used for water contact recreation. (MDE, Personal Communication 2007)

The Commonwealth of Virginia has a newly developed monitoring program and is in a period of ongoing evaluation. The current standard for marine waters is 104 enterococcus bacteria/100ml of sample for all waters designated as swimming beaches. There are currently no criteria for water contact recreation areas that are not defined as swimming beaches. (VDH, Beach Monitoring Program)

The EPA allows states to apply primary contact bacteriological criteria with a rebuttable presumption that the indicators show the presence of human fecal pollution. Rebuttal of this presumption must be based on a sanitary survey that demonstrates a lack of contamination from human sources. (40 CFR)

Methods:

Assateague Island National Seashore (ASIS) Natural Resource Management staff monitored water off of bayside water contact recreation areas weekly for enterococci bacteria using established collection procedures from the ASIS Beach Water Quality Monitoring Program. Sampling began on May 22nd and continued weekly until September 5th for a total of 16 sampling sessions (Table 1). The sites are located on the western shoreline of the developed portion of the Island (Figure 1) and on the western shore of the Tom's Cove beach area (Figure 2). All samples were analyzed for

enterococci bacteria using the Enterolert technique.

Site 1 Old Ferry Landing (FLD): (485726.76-N 4228074.12-E) Located off of the south west corner of the parking lot in the sandy area between the Naturalist Shack and the Crabbing Pier. (Figure 1)

Site 2 Bayside Campground (BAS): (485243.21-N 4229035.97-E) Located off of the first boardwalk through the picnic area on the south end of the parking lot. (Figure 1)

Site 3 Little Tom's Cove (LTC): (469661.04-N 4193266.91-E) Located off of the west side of the Beach Parking lot in the small cove south of the Marsh Boardwalk. (Figure 2)

Sites selected were identified as locations where the current uses include water contact recreation. Both Old Ferry Landing and Little Tom's cove are areas where water contact by visitors is included as part of ASIS Interpretive programming. The Bayside Campground site was selected due to its frequent use by visitors for wading, kayaking, and canoeing.

Sample collection was performed by staff and volunteers trained in aseptic procedures and sample bottle handling. Sterile 125 ml sample bottles, provided by MD DHMH lab in Salisbury, were properly handled to avoid contamination and placed upright in an ice filled cooler. At each sample site the technicians would wade into the water to about mid-thigh depth with a 1000 ml plastic sampling ladle. This ladle was rinsed at least two times, and then filled with sample. On shore, this sample water was poured into the sterile, pre-labeled sample bottle, capped and stored on ice for transport. The remaining water in the ladle was used to measure water temperature and salinity.

Data collected in the field included site number, bottle number, and time that sample was taken, air temperature in the shade, water temperature and salinity. Temperature measurements in °C were collected using VWR Scientific Digital Thermometers (1% accuracy). Salinity concentrations were determined using an SPER Scientific model 300011 salinity refractometer which was calibrated at 0 parts per thousand (ppt) with distilled water before sampling. Weather conditions were noted in the field and checked off on the data sheet as either: sunny, cloudy, overcast, raining, windy, calm or other. Rainfall amounts were determined using a rain gauge located at Assateague Island National Seashore headquarters. Tide predictions were obtained from the National Oceanic and Atmospheric Administration's National Ocean Service website for Ocean City, MD and for Toms Cove, VA. Lastly, the presence of possible contaminants was noted.

Laboratory analysis of all samples for the fecal indicator bacteria enterococcus using the Enterolert method was performed by the Maryland Department of Health and Mental Hygiene, Eastern Shore Regional Laboratory (ESRL) in Salisbury, Maryland. Assateague staff transported samples on ice within 6 hours of the first sampling event. The lab reported the results to the Park by fax within 24 hours and mailed hard copies of the results within two weeks. Laboratory results and field data were entered into an

Access/Excel database. This database was also used to store and calculate the geometric mean (geomean) of the enterococci counts for the entire survey.

The geomean of sample results is used to evaluate bacteria levels over consecutive sampling periods. The geomean is calculated using the present lab counts plus the previous four sample results. The formula used to calculate the geometric mean is as follows: $GMy = \text{antilog } 1/N \sum \log y$. The geomean, GMy, is the antilogarithm of the mean of the natural logarithms of the sample counts (y). This formula is programmed into the database to automatically calculate the geomean of the water samples. The Enteolert protocol for marine waters requires 10ml of the collected sample be diluted in a 90ml sterile blank for a total volume of 100ml. As a result tests producing zero colonies / 100ml are reported as <10 (0-9) to give a more accurate representation of this sub-sample. For the purpose of calculating and graphing the geomean all results reported as <10 were entered into the database as 9 (Table 1, Figure 4). The results of this calculation provide a pre-programmed margin of safety by delivering a calculated value that is most likely higher than the actual geomean. Single sample results reported as <10 are graphically represented as 1 (Figure 3).

Results and Discussion:

The Old Ferry Landing site in the Sinepuxant District showed the highest bacteria levels of the survey (Figure 3). The first spike in bacteria levels was measured on July 5th (Table 1). Lab results reported 306 MPN (Most Probable Number) enterococcus colonies/100ml. The following weeks indicated a steady decline in bacteria levels until July 31st when they fell to 31 MPN. Bacteria levels then began to increase again until a second spike of 306 MPN on August 28th (Table 1). Following MD State criteria for use, none of the single sample results exceeded limits for infrequent full body contact recreation. Only single sample results for 5 July and 28 August exceeded MD standards for occasional full body contact recreation (Table 1). However the geometric mean for the Old Ferry Landing Site exceeded the MD state limit of 35 colonies/100 ml on 17 July and never dropped below 52 MPN for the remainder of the survey (Figure 4). A sanitary survey of the area could not produce any point sources of human fecal contamination. Horse feces were observed at the site during 5 different sampling sessions and the presence of horses in the area was confirmed during an additional 4 sessions. Adjacent marshes are also frequented by deer, sika elk, raccoon, fox, and many different species of shorebirds and waterfowl. This evidence suggests that the elevated bacterial levels at the site are a result of wildlife contamination. The location of the site behind Great Egging Island may cause a reduction in tidal flushing and is believed to be a contributing factor (Figure 1).

Results for the Bayside Campground Site in the Sinepuxant District showed only small elevations in bacteria levels during the survey (Figure 3). The highest single sample result of 64 MPN was recorded on August 21st. The second highest single sample result of 31 MPN was recorded on July 10th (Table 1). All results for samples taken at Bayside Campground were well below the MD State criteria for frequent full body contact recreation. The geometric mean for the Bayside Campground Site reached a maximum

of 13.90 MPN never exceeding the MD State limit of 35 colonies/100 ml (Figure 4). Horse feces were observed at this site for 11 different sampling sessions. The presence of other species of wildlife in the immediate area as well as adjacent marshes is also common. The location of the Bayside Campground site and its close proximity to the main channel of the Sinepuxent Bay is believed to provide adequate tidal flushing to counter any significant wildlife contamination. The bacterial water quality at this site appears to be at a level sufficient to support water contact recreation for all designations.

Results for the Little Tom's Cove Site in the Tom's Cove District also showed only small elevations in bacteria levels during the survey (Figure 3). The highest single sample result of 64 MPN was recorded on August 21st. The second highest single sample result of 42 MPN was recorded on both August 7th and September 5th (Table 1). All results for samples taken at Little Tom's Cove were well below the Virginia State criteria of 104 colonies/100ml. The geometric mean for Little Tom's Cove reached a maximum of 24.67 MPN which is below the EPA recommended limit of 35 colonies/100ml (Figure 4). There was no evidence of wildlife contamination found at the sampling site during the survey. However, deer, horses, birds, and small mammals were found to have direct access to adjacent waters. A survey of the site identified a sewerage holding tank for Tom's Cove Visitors Center (Figure 2). The system is of good working order and is not considered to be a possible source of contamination. The geography of the sampling site and its proximity to the Chincoteague Inlet is believed to allow for adequate tidal flushing to counter any possible wildlife contamination. The bacterial water quality at Little Tom's Cove appears to be at a level sufficient to support water contact recreation.

The outfall for the ASIS sewerage treatment plant in the Sinepuxent District and the septic system for the Old Coast Guard Station in the Tom's Cove District were originally considered to be possible point sources for fecal contamination. After further investigation it was decided that their distant proximity to the sampling areas prevents any significant contamination from occurring. Portable restroom facilities were located within close proximity to the sampling areas. These facilities are pump-out facilities and receive regularly scheduled maintenance which prevents any possibility of accidental discharge.

The Bayside sites sampled during this survey are currently not formally designated as water contact recreation areas. If water contact activities are encouraged or sponsored by park staff or volunteers then some designation may be warranted. In the event that a designation occurs, the nature and frequency of usage should be considered and if appropriate, a monitoring program may need to be established. This survey includes data for weeks of peak visitation during a single season. Environmental conditions such as wind and rainfall may have had a significant effect on localized bacterial levels. If funding is available it is recommended that additional data be collected at the Bayside Sites to support these findings. Bacterial source tracking and/or antibiotic resistance testing can be employed to confirm the source of any contamination. If the bacterial water quality is found inadequate to support its uses then action will need to be taken to ensure the safety of the visiting public and their protection from possible health risks.

Table 1:
Enterococci Colony Counts and Geometric Mean MPN/100mls

Date		FLD	BAS	LTC
22-May	Counts	*9	*9	*9
30-May	Counts	*9	*9	*9
5-Jun	Counts	*9	*9	*9
12-Jun	Counts	*9	*9	10
19-Jun	Counts	*9	*9	*9
	GeoMean	9	9	9.19166
26-Jun	Counts	10	*9	10
	GeoMean	9.19166	9	9.3874
5-Jul	Counts	306	10	20
	GeoMean	18.6076	9.19166	11.0129
10-Jul	Counts	164	31	31
	GeoMean	33.2514	11.7711	14.1035
17-Jul	Counts	87	*9	10
	GeoMean	52.3438	11.7711	14.1035
24-Jul	Counts	99	*9	31
	GeoMean	84.5559	11.7711	18.0614
31-Jul	Counts	31	*9	*9
	GeoMean	106.027	11.7711	17.6848
7-Aug	Counts	111	*9	42
	GeoMean	86.5639	11.5257	20.5137
14-Aug	Counts	124	*9	*9
	GeoMean	81.8563	9	16.0184
21-Aug	Counts	178	64	64
	GeoMean	94.4566	13.3239	23.2196
28-Aug	Counts	306	10	*9
	GeoMean	118.372	13.6076	18.1314
5-Sep	Counts	87	10	42
	GeoMean	145.506	13.8974	24.6736

* Enterococci counts reported as <10 entered as 9 for geometric mean calculation.

Key: FLD = Old Ferry Landing
BAS = Bayside Campground
LTC = Little Tom's Cove

Figure 1

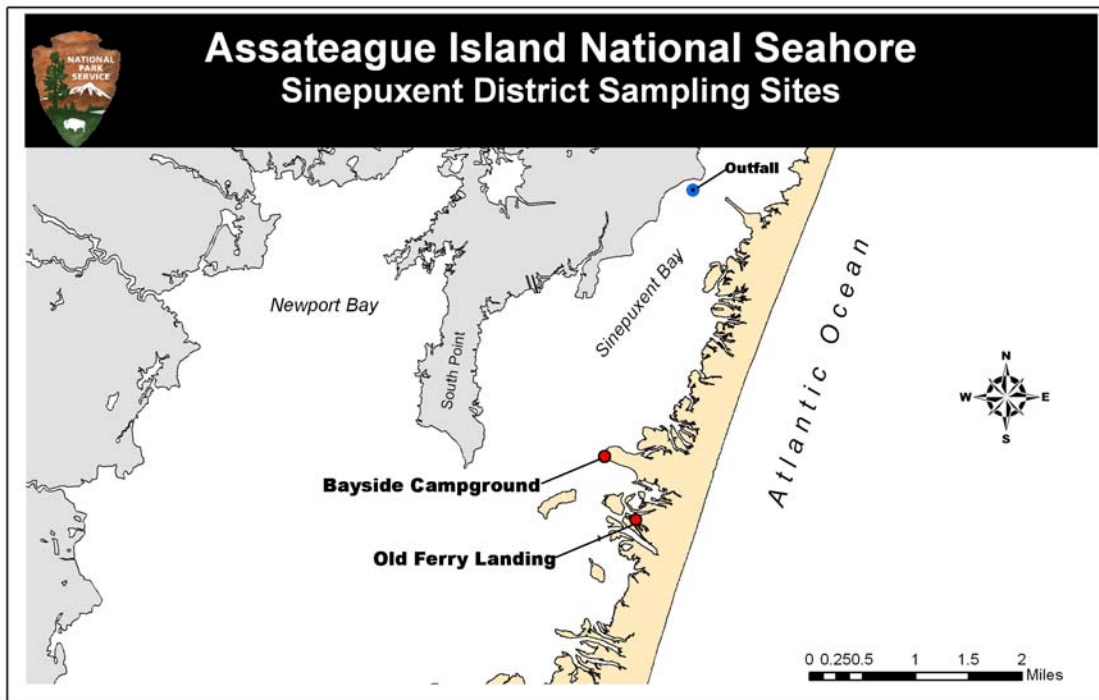


Figure 2

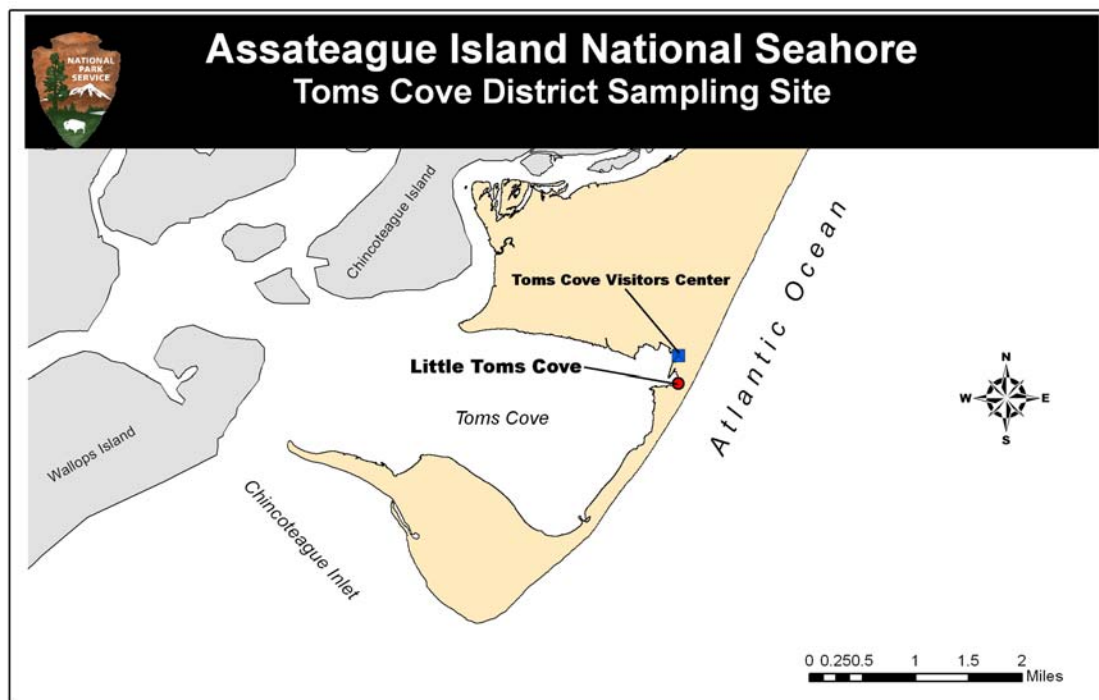


Figure 3: Enterococci Counts

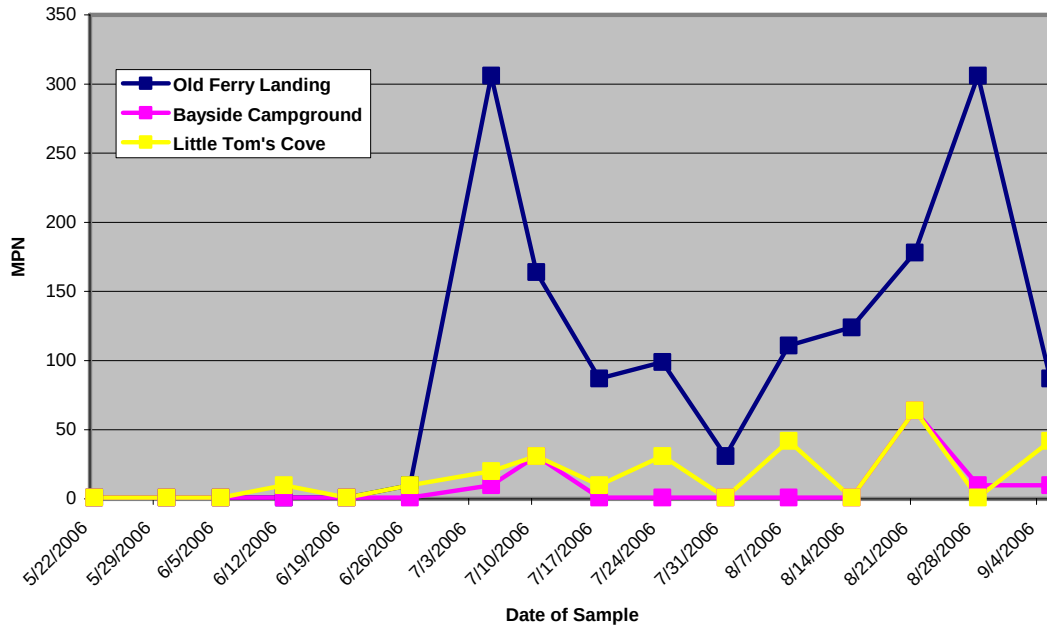
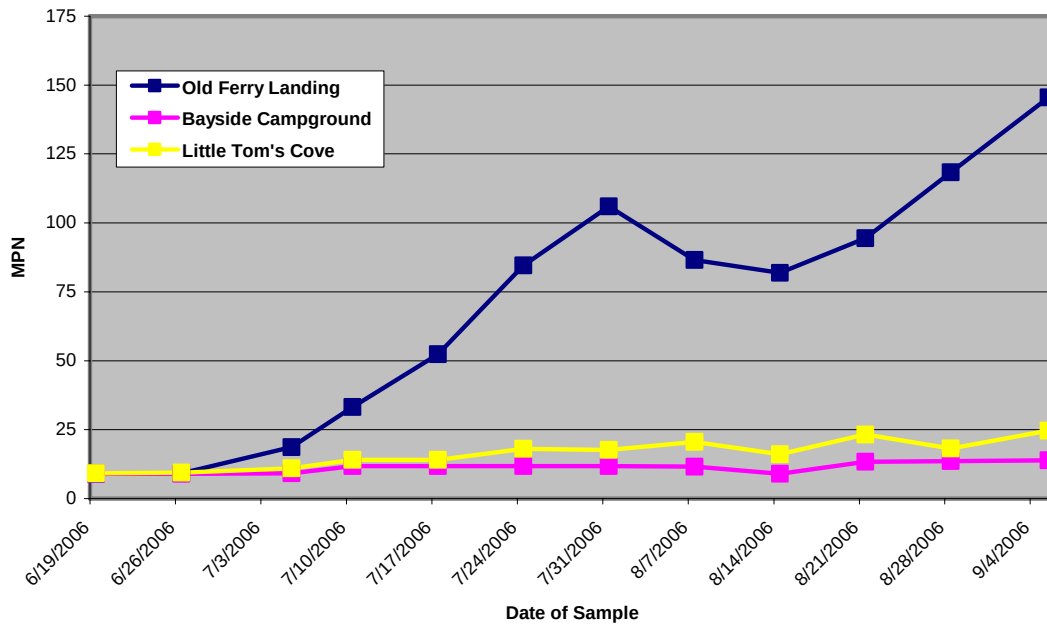


Figure 4: Geometric Mean



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