

**Reference D**  
**REFERENCE MANUAL 83**  
**BATHING BEACHES**

NPS Park Managers will reduce the risk of waterborne diseases by ensuring designated bathing beaches are properly operated, maintained, monitored and deficiencies promptly corrected, in compliance with applicable state or local regulations or the following NPS policies. Bathing beaches can be located at lakes, rivers, oceans, hot springs, and other bodies of water.

**A. GENERAL**

- A.1 Bathing beach monitoring is required for each designated beach. Designated beaches are those that the Park has identified (using signs, brochures etc.) as available to the public for contact recreational water activities. Monitoring is recommended for other areas that are heavily used (40 or more people per 100 linear feet of shoreline). Specific requirements of the monitoring program include:
- a. Conducting a sanitary survey;
  - b. Preparing a bathing beach monitoring protocol. This protocol includes the names of areas to be sampled; sampling station locations; a map or sketch of each area showing the location of each sampling station; bacterial standard used; and the name of the laboratory doing the bacterial analyses;
  - c. Sampling for enterococcus or *Escherichia coli* bacteria levels; and
  - d. Issuing swimming advisories when bathing beach waters exceed the bacterial standards.
- A.2 A copy of the bathing beach monitoring plan and current bathing beach sanitary survey report will be sent to the PHS Consultant for review and concurrence approximately one month before the beginning of the recreational season.
- A.3 Samples will be collected in conformance with the most recent edition of Standard Methods for the Examination of Water and Wastewater.
- A.4 Analyses will be done in conformance with the most recent edition of Standard Methods for the Examination of Water and Wastewater. Parks that have their own laboratory should meet state certification requirements. Parks that do not do their own sample analyses will use a certified microbiological laboratory.
- A.5 Parks located in states that have bathing beach bacterial standards will comply with those standards or DO-83, whichever is more stringent.
- A.6 Parks will submit bacteriological sampling results to the PHS Consultant.

- A.7 When the applicable bacterial density standard is exceeded, Park managers will report the bacterial density results to the PHS Consultant and the applicable state agency. Advise the PHS Consultant, applicable state agency and the local news media that a health advisory regarding the affected area will be posted. The advisory will notify the public of the potential health risks from swimming at the designated beach. The affected beach will be re-sampled immediately by taking two samples each day at each sampling location where the bacterial standard was exceeded. Re-sampling will be continued until the bacterial standard is not exceeded for two consecutive days. The PHS Consultant can waive this re-sampling requirement. Resume routine monitoring and notify the PHS Consultant, the local public health agency and the news media of the decision to reopen the beach. All signs should be removed.

## **B. SANITARY SURVEY**

- B.1 The sanitary survey is a health risk evaluation of the swimming beach and surrounding area to determine whether the beach is safe for water contact activities such as wading, swimming and snorkeling. The survey takes into consideration all factors that have an actual or potential bearing on the microbial quality of the water. It includes potential sources of pollution, physical factors that can affect the distribution and concentration of microorganisms, and the microbial quality of the water at the time of the survey.
- B.2 Potential sources of human-caused bacterial contamination include but are not restricted to: sewage outfalls; storm drains; raw sewage overflows from manholes, septic tanks and sewage treatment plants; boating activities and people using the beach. Potential sources of animal-caused microbial contamination include, but are not limited to, streams, animal enclosures, feedlots and forage areas for both domestic and wild animals.
- B.3 Physical factors that have a bearing on water quality include precipitation, topography, runoff patterns, prevailing winds, tides and currents. Water quality is also affected by characteristics of the receiving water such as thermal and salinity stratification, water depth, and surface area.
- B.4 The Park should conduct the sanitary survey annually before the beginning of the beach season. It will help you in selecting sampling locations for your beach monitoring program. It will also help you identify potential source(s) and pathway(s) of contamination if the beach water quality subsequently falls below the applicable bacterial standard. Contact your Regional Public Health Consultant if you have questions about or need assistance in conducting the sanitary survey.

## **C. BEACH MONITORING PROTOCOL.**

- C.1 Data Form

Enclosure 1 is a recommended form for consolidating your beach monitoring data. It includes information about the location, time, date and bacterial densities of each water

sample. At the end of each month during the bathing beach season, send a copy of the current month's data form to your Regional Public Health Consultant.

## C.2 Sampling Location

Sample locations should reflect the water quality within the entire recreational zone. The majority of samples should be taken in areas of heaviest use. They should include sites that potentially can be affected by point discharges and surface runoff. Examples are locations adjacent to drains and natural contours that could discharge storm water collections or septic waste. The total number of samples taken at a bathing beach will depend on the size and intensity of use. A minimum of 3 sampling stations per beach is recommended.

## C.3 Sampling Frequency

Water samples should be collected as early as possible in the morning to accurately reflect the baseline bacterial quality. The first set of samples should be collected approximately two weeks before the beginning of the recreational season. This will provide sufficient time to re-sample if the initial samples indicate the bacterial standards have been exceeded. A weekly set of samples should be taken beginning with the first week and continuing through the last week of the recreational season. A minimum of one water sample should be collected for each beach sampling station each week.

## D. BACTERIAL STANDARDS

- D.1 For states that do not have their own bathing beach standards, enterococcus is the recommended bacterial indicator. However, you may not be able to use enterococcus if laboratory analysis is not readily available. In that case, the recommended standard is *E. coli*.
- D.2 Two types of bacterial density standards are recommended. One standard is the geometric mean. The geometric mean should be calculated weekly for each sampling station beginning with week five. It is a running mean calculated using the most recent five weekly samples. (See Enclosure 3 for an example of how to calculate the geometric mean.)
- D.3 The second bacterial density standard is the maximum standard. It is the bacterial density that should never be exceeded, even by one sample. It is the only standard available from the beginning of the sampling period until week five when the first geometric mean can be calculated.

D.4 Transcribe the bacterial density data (colonies/100 ml) onto your beach data form (Enclosure 1)

a. The recommended marine and fresh water bacterial standards are the following:

1. Marine Water Bathing Beaches

a. Enterococci

1). **35 enterococci/100 ml.** (Geometric Mean)

**Or**

2) **104 enterococci/100 ml.**

Not to be exceeded by any one sample.

2. Freshwater Bathing Beaches

a. Enterococci

1) **33 colonies/100 ml.** (Geometric Mean)

**Or**

2) **61 colonies/100 ml.**

Not to be exceeded by any one sample.

b. *E. coli*

1) **126 colonies/100 ml.** (Geometric Mean)

**Or**

2) **235 colonies/100 ml.**

Not to be exceeded by any one sample.

**E. NOTIFICATION, ADVISORY AND CLOSURE PROCEDURES**

E.1 An example of an advisory is the following:

**Bacterial levels exceed  
National Park Service standards for  
Beach recreational use.  
Because of the increased risk of contracting an  
illness,  
the National Park Service  
advises against swimming in the posted beach  
until further notice.  
Please contact the Park at  
telephone no. XXX-XXXX  
for updates on this advisory.**

Enclosure 1

SUMMARY BEACH BACTERIOLOGICAL DATA FORM

Beach Name: \_\_\_\_\_

Sample Station #: \_\_\_\_\_

Indicator Organism: \_\_\_\_\_

Date (D/M/Y)	Time	Colonies /100 ml	Geometric Mean (Last 5 Samples)	Collected By	Comments <sup>1</sup>

<sup>1</sup> Describe all activities that might affect the beach water quality (e.g., boating, storm water runoff, weather conditions, unusually large crowds).

## Enclosure 2<sup>1</sup>

### RECOMMENDED SAMPLING PROCEDURES

1. Collect samples using bottles provided by your laboratory.
2. Collect samples as early as possible in the morning before visitors begin using the beach.
3. Wade out into the surf about thigh deep and face the current, if any.
4. Collect the sample from an incoming wave, taking care to avoid getting debris into the sample.
5. The object is to avoid capturing surface water, and to collect from at least 1-foot depth.

Grasp the bottle near its base with one hand and remove the cap with the other. Be careful to avoid touching the inside of the cap or the rim of the bottle. Rotate your wrist so the mouth of the bottle is pointing downward at about a 45-degree angle. Rapidly plunge the bottle to a depth of about one foot. Rotate your wrist so the mouth of the bottle points up, loses its air bubble, and fills with water. Replace the bottle cap while still under water.

6. Lift the capped bottle out of the water. Remove the cap and pour out enough water to leave a 1/2-inch air space. Replace the cap. Be careful not to touch the lip of the bottle or the inside of the cap.
7. Immediately place the bottle in an upright position in a covered cooler containing sufficient ice to keep the samples cool until they arrive at the laboratory.
8. Record the sample bottle number, station name, date and time of sampling, sampler's name, and other appropriate information on the field data sheet (See Enclosure 1).
9. Transport the sample to the laboratory on ice, in a covered cooler preferable within six hours but no longer than twenty-four hours of sampling.

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<sup>1</sup> See most recent edition of Standard Methods for the Examination of Water and Wastewater, 18th Edition, Part 9060 for additional information about sample collection, preservation and storage.

Enclosure 3

Two Geometric Mean (GM) Sample Calculations Using the Results of 5 Weekly Samples Taken From the Same Sampling Station

$$\text{GM} = \text{antilog} [1/n (\log \text{ sample 1} + \log \text{ sample 2} + \log \text{ sample 3} + \log \text{ sample 4} + \log \text{ sample 5})]$$

**Example 1:** Week 1 = 23 enterococci/100 ml  
Week 2 = 33 enterococci/100 ml  
Week 3 = 33 enterococci/100 ml  
Week 4 = 37 enterococci/100 ml  
Week 5 = 47 enterococci/100 ml

**Example 2:** Week 2 = 33 enterococci/100 ml  
Week 3 = 33 enterococci/100 ml  
Week 4 = 37 enterococci/100 ml  
Week 5 = 47 enterococci/100 ml  
Week 6 = 53 enterococci/100 ml

**Step 1:** log 23 = 1.36172  
log 33 = 1.51851  
log 33 = 1.51851  
log 37 = 1.56820  
log 47 = 1.67209  
7.63903

**Step 1:** log 33 = 1.51851  
log 33 = 1.51851  
log 37 = 1.56820  
log 47 = 1.67209  
log 53 = 1.72458  
8.00189

**Step 2:**  $[1/n (7.63903)] = [1/5 (7.63903)] = 1.52781$

**Step 2:**  $[1/n (8.00159)] = [1/5 (8.00189)] = 1.60003$

**Step 3:** Antilog 1.52781 = 33.7 = 34 colonies/100 ml

**Step 3:** Antilog 1.60003 = 39.8 = 40 colonies/100 ml

**Conclusion:** The GM of 34 colonies/100 ml does not exceed the marine beach standard of 35 enterococci colonies/100 ml.

**Conclusion:** The GM of 40 colonies/100 ml does exceed the marine beach standard of 35 enterococci colonies/100 ml.

\*Note: n = the number of samples