



**State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES**

Jim Doyle, Governor  
 Scott Hassett, Secretary

101 S. Webster St.  
 Box 7921  
 Madison, Wisconsin 53707-7921  
 Telephone 608-266-2621  
 FAX 608-267-3579  
 TTY 608-267-6897

**BEACH MONITORING PROGRAM REQUIREMENTS**

EPA is required under Clean Water Act section 406(a), to publish performance criteria for monitoring and assessment of coastal beaches and for promptly notifying the public of any exceedance of water quality standards. Section 406(b) authorized EPA to award grants to states to implement monitoring and notification programs, but only if the programs meet certain requirements. One of these requirements is that the monitoring and notification programs must be consistent with EPA's National Beach Guidance and Required Performance Criteria.

The Wisconsin Beach Monitoring Program was developed in accordance with EPA performance criteria. Therefore, this document sets forth performance criteria for the following:

- (1) Sampling and monitoring
- (2) Promptly notifying the public of exceedances of the water quality standard for *E. coli*
- (3) Reporting

Adherence to the program performance criteria is required for all participants in the Wisconsin Beach Monitoring Program.

**I. SAMPLING & MONITORING**

**A. Tiered Monitoring Plan**

The tiered monitoring plan describes the monitoring requirements for *High, Medium* and *Low* priority beaches. It also addresses when basic sampling should be conducted, when additional samples should be collected and where and how to collect samples.

**High Priority Beaches**

<i>Basic Sampling</i>	<i>Additional Sampling</i>	<i>Where to Sample</i>	<i>Depth to Sample</i>
<ul style="list-style-type: none"> <li>• Begin sampling at least one week prior to the swimming season</li> <li>• Sample at least <b>5 times</b> per week during the swimming season</li> </ul>	<ul style="list-style-type: none"> <li>• After heavy rainfall (generally ¼ to ½ inch- depending on local conditions)</li> <li>• After a major pollution event where potential exists that indicator levels may be expected to exceed standard (sewage leak, spill)</li> <li>• Immediately following the exceedance of the water quality standards</li> </ul>	<p><i>Depends on characteristics of your beach</i></p> <ul style="list-style-type: none"> <li>• Middle of typical bathing area</li> <li>• For longer beaches, one sample for every 500m of beach</li> </ul>	<ul style="list-style-type: none"> <li>• Knee depth</li> <li>• Where 24-30 inch depth is first encountered, take sample 6-12 inches below surface of water</li> <li>• Other as you feel is necessary for your beach (<i>e.g., surface of water, waist depth, sediment</i>)</li> </ul>

**Medium Priority Beaches**

<i>Basic Sampling</i>	<i>Additional Sampling</i>	<i>Where to Sample</i>	<i>Depth to Sample</i>
<ul style="list-style-type: none"> <li>• Begin sampling at least one week prior to the swimming season</li> <li>• Sample at least <b>2 times</b> per week during the swimming season</li> </ul>	<ul style="list-style-type: none"> <li>• After heavy rainfall (generally ¼ to ½ inch- depending on local conditions)</li> <li>• After a major pollution event where potential exists that indicator levels may be expected to exceed standard (sewage leak, spill)</li> <li>• Immediately following the exceedance of the water quality standards</li> </ul>	<p><i>Depends on characteristics of your beach</i></p> <ul style="list-style-type: none"> <li>• Middle of typical bathing area</li> <li>• For longer beaches, one sample for every 500m of beach</li> </ul>	<ul style="list-style-type: none"> <li>• Knee depth</li> <li>• Where 24-30 inch depth is first encountered, take sample 6-12 inches below surface of water</li> </ul>

**Low Priority Beaches**

<i>Basic Sampling</i>	<i>Additional Sampling</i>	<i>Where to Sample</i>	<i>Depth to Sample</i>
<ul style="list-style-type: none"> <li>• Begin sampling at least one week prior to the swimming season</li> <li>• Sampling frequency at low priority beaches should be determined by state and local authorities, taking into account resource constraints and evaluation of risk factors at individual beaches.</li> </ul>	<ul style="list-style-type: none"> <li>• After a major pollution event where potential exists that indicator levels may be expected to exceed standard (sewage leak, spill)</li> <li>• Immediately following the exceedance of the water quality standards</li> </ul>	<p><i>Depends on characteristics of your beach</i></p> <ul style="list-style-type: none"> <li>• Middle of typical bathing area</li> </ul>	<ul style="list-style-type: none"> <li>• Knee depth</li> <li>• Where 24-30 inch depth is first encountered, take sample 6-12 inches below surface of water</li> </ul>

**B. Sampling Protocol**

To assure consistency in collecting samples for analysis, the following procedures will be used:

- 1) Specific sites will be designated for collecting samples during the bathing season. Samples will be collected exclusively at these sites for the duration of the sampling period.
- 2) Sample bottles will be prepared and provided by the laboratories charged with conducting bacteria analyses.

## General Rules of Sampling

- a. Take extreme care to avoid contaminating the sample and sample container.
  - Do not remove bottle covering and closure until just prior to obtaining each sample.
  - Do not touch the inside of the sample container.
  - Do not rinse the sample container.
  - Do not put caps on the ground while sampling.
  - Do not transport the samples with other environmental samples.
- b. Adhering to sample preservation and holding time limits is critical to the production of valid data.
  - Samples should be labeled, iced or refrigerated at 1 - 4 degrees C immediately after collection and during transit to the lab.
  - Care should be taken to ensure that sample bottles are not totally immersed in water during transit or storage.
  - Samples should arrive in the lab no later than 24 hours after collection. Whenever possible samples should arrive at the lab on the day of collection, preferably before 2 p.m.
- c. The sampler will complete the laboratory data form noting time, date, and location of sample collection, current weather conditions (including wind direction and velocity), water temperature, clarity, wave height and any abnormal water conditions.

## Sampling Method

- (1) Carefully move to the first sampling location. Water should be approximately knee deep. While wading slowly in the water, try to avoid kicking up bottom sediment at the sampling site.
- (2) Open a sampling bottle and grasp it at the base with one hand and plunge the bottle mouth downward into the water to avoid introducing surface scum.
- (3) The sampling depth should approximately 6 to 12 inches below the surface of the water.
- (4) Position the mouth of the bottle into the current away from your hand. If the water body is static, an artificial current can be created by moving the bottle horizontally with the direction of the bottle pointed away from you.
- (5) Tip the bottle slightly upward to allow air to exit and the bottle to fill.
- (6) Make sure the bottle is completely filled before removing it from the water.
- (7) Remove the bottle from the water body and pour out a small portion to allow an air space of 2 cm for proper mixing of the sample before analyses.
- (8) Tightly close the cap and label the bottle.
- (9) Store sample in a cooler filled with ice or suitable cold packs immediately.

## **D. Analytical Methods**

All sample analyses shall be conducted by State certified labs using one of the following EPA approved methods:

*Most probable number (MPN) tests for E. coli:*

- LTB EC-MUG (Standard Methods 9221B.1/9221F)
- ONPG-MUG (Standard Methods 9223B, AOAC 991.15, Colilert, Colilert-18, and Autoanalysis Colilert)
- CPRG-MUG (Standard Methods 9223B, Colisure™)

*Membrane filter tests for E. coli:*

- MEndo, LES-Endo, or mFC followed by transfer to NA-MUG media (Standard Methods 9222B/9222G or 9222D/9222G)
- MI Agar
- M-ColiBlue24 Broth

## **II. PROMPT NOTIFICATION**

### **A. Beach Signs**

EPA recommends the following criteria for *E. coli*:

- **235** cfu/100mL as a single sample maximum
- **126** cfu/100mL as a geometric mean of at least 5 samples collected over a 30-day period.

### ***Posting Beach Advisories***

#### High Priority Beaches

High priority beaches shall to post advisory signs (see figure 1) under the following conditions:

- whenever the sample results for *E. coli*, exceeds **235** cfu/100mL as a single sample maximum
- and/or whenever the sample results for *E. coli*, exceeds **126** cfu/100mL as a geometric mean of at least 5 samples collected over a 30-day period.

#### Medium Priority Beaches

Medium Priority beaches shall post beach advisory signs whenever the level of *E. coli* in the beach water sample exceeds 235 cfu/100 mL.

#### Low Priority Beaches

Monitoring at low priority beaches and the posting of signs will be determined on a case-by-case basis.

Low priority beaches that are required to monitor weekly are shall post advisory signs whenever the level of *E. coli* in the beach water sample exceeds 235 cfu/100 mL.

#### Multiple Samples

In cases where multiple samples are collected at one site, sample results may be averaged and the averaged result may be used to determine the need for an advisory or closure.

#### Removing Advisory Signs

Beach advisory signs may be removed when the sample result of one day of sampling following an exceedance, is below the established criteria.

### ***Beach Closures***

**All** beaches shall be closed under the following conditions:

- Whenever a human health hazard exists as determined by the local health department (i.e. reported illnesses).
- After a major pollution event where potential exists that indicator levels may be expected to exceed standard (sewage leak, spill)
- After a significant rainfall event that is determined to impact a beach area
- **All** beaches shall post closure signs whenever the level of *E. coli* in the beach water sample exceeds 1000 cfu/100mL.

Re-opening Beaches

Beach closure signs may be removed when the sample result of one day of sampling following an exceedance, is below the established criteria.

*Beach Open Signs*

In cases where "Open" signs are being used they shall remain posted at beaches as long as none of the conditions for posting advisory or closure signs exist .

**CAUTION:**  
**WATER QUALITY ADVISORY**

**FOR YOUR SAFETY**

- Swim at your own risk
- Do not ingest lake water
- Shower after swimming
- Wash hands before eating
- Do not swim if you are ill

*Increased risk of illness may be present  
Based on recent monitoring for E. coli bacteria*

FOR MORE INFORMATION:  
1-800-441-4636 ext. 1500 [www.wibeaches.us](http://www.wibeaches.us)

**Water Quality Notice**

ALL NATURAL BODIES OF WATER CONTAIN MICROSCOPIC ORGANISMS. THIS AREA IS MONITORED FOR E. COLI BACTERIA, AN INDICATOR OF THE POSSIBLE PRESENCE OF HUMAN HEALTH RISKS. IF BACTERIA LEVELS ARE ABOVE STATE HEALTH STANDARDS, AN ADVISORY OR CLOSURE SIGN WILL BE POSTED AT THIS LOCATION. DO NOT INGEST LAKE WATER. SWIM AT YOUR OWN RISK.

For latest water conditions: 1-800-441-4636 ext. 1500  
[www.wibeaches.us](http://www.wibeaches.us)

**STOP**  
**CLOSED**

*Based on recent monitoring for E. coli bacteria  
Serious risk of illness may be present*

**THIS AREA IS CLOSED  
TO SWIMMING**

FOR MORE INFORMATION:  
1-800-441-4636 ext. 1500  
[www.wibeaches.us](http://www.wibeaches.us)

## So Why 235 CFU/100 mL and 1000 CFU/100 mL?

Dr. Gregory Kleinheinz - UW Oshkosh

### Terminology:

What is the difference between CFU/mL and MPN/mL? CFU means “Colony Forming Unit” and MPN is “Most Probable Number”. The traditional membrane filtration tests for bacterial water quality actually count ‘colonies’ of bacteria and thus is reported as CFU. However, the newer defined substrate tests such as Colisure or Coli-ert report data as MPN, which is a statistical representation of what level of *E.coli* is likely present in a sample. For the purposes of reporting these terms have been used interchangeably.

### The standards:

The “Advisory” standard of 235 CFU/100mL (*E.coli* in water) was adopted based upon data from three US EPA studies conducted in the late 1970s (2-4). These studies indicate that *E.coli* and/or Enterococci are the best bacterial indicators to assess the risk of acquiring a gastrointestinal illness as a result of using recreational waters. These levels are the original recommendation of US EPA and they were reaffirmed in a revisiting of the issue in 2002 (1). Additional epidemiological studies are set to take place during the BEACH program and should be completed by 2006. These studies are detailed in the following reports and are available free in \*. \*.pdf format from the EPA website ([www.epa.gov](http://www.epa.gov)).

- 1) USEPA, 2002. Implementation Guidance for Ambient Water Quality Criteria for Bacteria. U.S. Environmental Protection Agency. EPA-823-B-02-003. May 2002 Draft.
- 2) USEPA, 1986. Ambient Water Quality Criteria for Bacteria–1986. U.S. Environmental Protection Agency. EPA-440/5-84-002.
- 3) USEPA. 1984. Health Effects Criteria for Fresh Recreational Waters. U.S. Environmental Protection Agency. EPA-600/1-84-004.
- 4) Cabelli, V. J. 1983. Health effects criteria for marine recreational waters. U. S. Environmental Protection Agency, Cincinnati, OH. EPA-600/1-80-031.

The epidemiological studies indicated that a level of 235 CFU of *E.coli*/100mL of recreational water is approximately equal to 8 cases of gastrointestinal illness per 1000 recreational water users. The “Closure” level of 1000 CFU *E.coli*/100mL was adopted by the WI DNR based upon data from the studies mentioned above and represent a risk of approximately 14 cases of gastrointestinal illness per 1000 recreational water users.

### Why *E.coli* and not Enterococci?

In the study listed as #2 above, *E.coli* levels were found to have the best correlation with highly credible cases of gastrointestinal illness in freshwater systems. While Enterococci had the best correlation in marine systems, either *E.coli* or Enterococci were deemed acceptable fecal indicators in freshwater systems. In addition to the EPA studies, the WI DNR conducted a study prior to the first BEACH season of 2003 in which 3 State Park beaches were monitored for *E.coli* and Enterococci. The *E.coli* yielded the most reliable and consistent results in their study.