



Beach Monitoring Program Requirements

Revised 2025

The U.S. Environmental Protection Agency (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 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 AND 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

Basic Sampling

- Begin sampling at least one week prior to the swimming season. While this is best practice, resource constraints may prohibit sampling outside the beach season. Sampling shall be conducted at minimum for the frequency and duration specified in the contract with DNR.
- Sample at least **3 times** per week during the swimming season.

Additional Sampling

- After heavy rainfall, generally $\frac{1}{4}$ to $\frac{1}{2}$ inch, depending on local conditions.
- After a major pollution event where potential exists that indicator levels may be expected to exceed the standards, such as a sewage leak or spill.
- Immediately following the exceedance of the water quality standards.

Where to Sample

- For smaller beaches, the middle of the typical bathing area.
- For longer beaches, one sample for every 500 meters of beach.

Depth to Sample

- Sampling is conducted at approximately knee depth.

- Where 24-30 inch depth is first encountered, take the sample 6-12 inches below the surface of the water.
- Other samples as necessary for your beach (*for example: surface of water, at waist depth, sediment*).

Medium Priority Beaches

Basic Sampling

- Begin sampling at least one week prior to the swimming season. While sampling at least one week before beach season is best practice, resource constraints may prohibit sampling outside the beach season. Sampling shall be conducted at minimum for the frequency and duration specified in the contract with DNR.
- Sample at least **2 times** per week during the swimming season.

Additional Sampling

- After heavy rainfall (generally $\frac{1}{4}$ to $\frac{1}{2}$ inch, depending on local conditions).
- After a major pollution event where potential exists that indicator levels may be expected to exceed standard (sewage leak, spill).
- Immediately following the exceedance of the water quality standards.

Where to Sample

- For smaller beaches, the middle of the typical bathing area.
- For longer beaches, one sample for every 500 meters of beach.

Depth to Sample

- Knee depth.
- Where 24-30 inch depth is first encountered, take sample 6-12 inches below surface of water.

Low Priority Beaches

Basic Sampling

- Begin sampling at least one week prior to the swimming season. While sampling at least one week before beach season is best practice, resource constraints may prohibit sampling outside the beach season. Sampling shall be conducted at minimum for the frequency and duration specified in the contract with DNR.
- Sampling frequency at low priority beaches should be determined by state and local authorities, considering resource constraints and evaluating risk factors at individual beaches.

Additional Sampling

- After a major pollution event where potential exists that indicator levels may be expected to exceed standard (sewage leak, spill).
- Immediately following the exceedance of the water quality standards.

Where to Sample

- The middle of the typical bathing area.
- For longer beaches, one sample for every 500 meters of beach.

Depth to Sample

- Knee depth.
- Where 24-30 inch depth is first encountered, take sample 6-12 inches below surface of water.

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 Celsius 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 person taking samples should complete the laboratory data form noting time, date and location of sample collection, current weather conditions (including wind direction and velocity), water temperature, water 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 and pour out a small portion to allow an air space of ½ to 1 inch 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.

C. 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:

- Multiple-tube: Standard Methods 9221B.3 - 2014/9221F - 2014
- Multiple tube/multiple well: Standard Methods 9223B – 2016; AOAC 991.15; Colilert, Colilert-18

Membrane filter tests for E. coli:

- Two-step: EPA 1103.1; Standard Methods 9222B - 2015/9222I – 2015, 9213D – 2007; ASTM D5392 - 93
- Single step: EPA 1603, 1604; m-Colibblue24, KwikCount™EC

qPCR, ddPCR or other rapid testing method subject to approval by both EPA and DNR.

II. PROMPT NOTIFICATION

A. Beach Signs

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

- **235** colony-forming units (cfu) per 100 milliliters (mL) of water single sample maximum will be used as a Beach Action Value (BAV) for posting advisories. Depending upon the bacteria test used, the unit of measure may be expressed as most probable number (MPN) per 100 mL. For the purposes of reporting these units are used interchangeably.
- **1,000** cfu (or MPN)/100mL single sample maximum will be used as a Beach Action Value for posting closures.

Posting Beach Advisories

All beaches shall post advisory signs (depicted in Figures 1 and 2) whenever the sample results for *E. coli* exceed **235** cfu (or MPN)/100mL as a single sample maximum.

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.

Beach advisory signs may be removed when the sample result of one day of sampling following an exceedance is below 235 cfu (or MPN)/100mL.

Posting Beach Closures

All beaches shall post closure signs 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 the 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.
- Whenever the level of *E. coli* in the beach water sample equals or exceeds 1000 cfu (or MPN)/100mL.
- When dangerous waves and/or currents are observed or forecast. This is at the beach manager's discretion.
- When known or suspected Harmful Algal Blooms are present. This is at the beach manager's discretion.

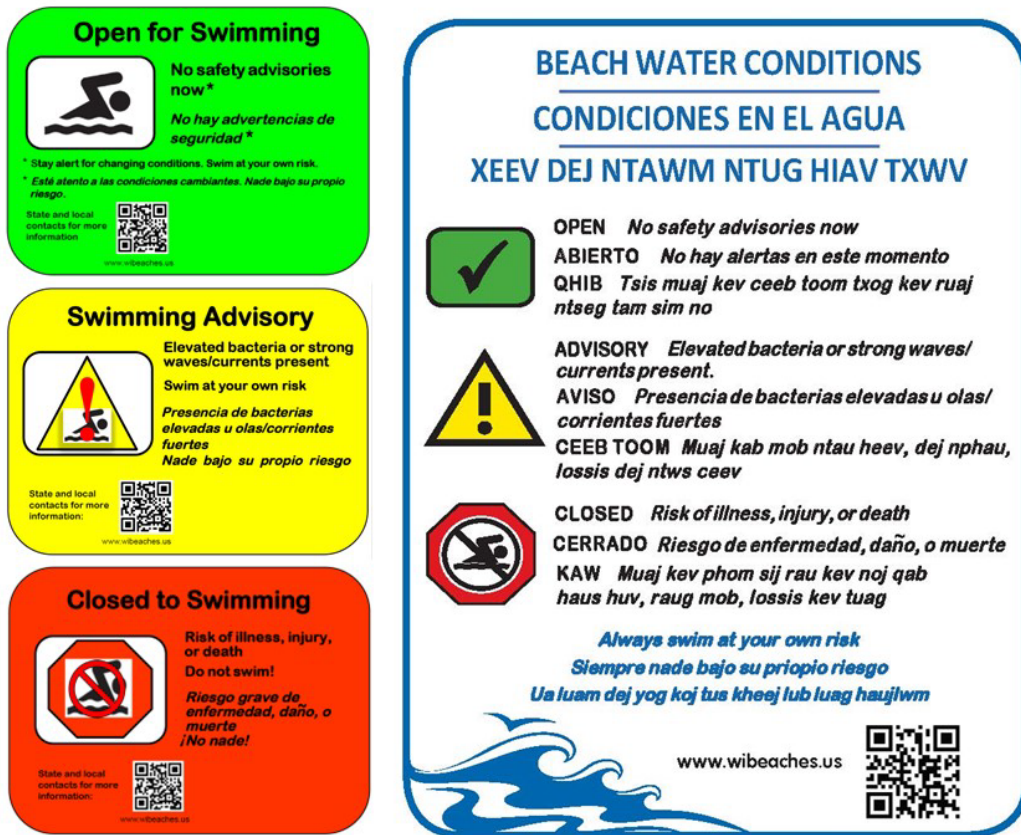
Beach closure signs may be removed when:

- The sample result of one day of sampling following an exceedance is below 1000 cfu (or MPN)/100mL
- Other health hazards (spills, waves/currents/algae blooms) are no longer present.

Figure 1. Beach notification placards developed in 2017, suitable for beaches not subject to high waves and/or dangerous currents, such as inland beaches



Figure 2. Revised beach notification placard option 2025, suitable for beaches subject to high waves and/or dangerous currents.



Appendix

Significance of the Beach Action Values 235 CFU/100 mL and 1000 CFU/100 mL

By Dr. Gregory Kleinheinz, UW Oshkosh and Dr. Diane Packett, Wisconsin DNR

Terminology: What is the difference between CFU/mL and MPN/mL?

CFU means “Colony Forming Unit” and MPN means “Most Probable Number.” The traditional membrane filtration tests for bacteria count ‘colonies’ of bacteria and thus are reported as CFU. However, the newer defined substrate tests such as Colilert and Colilert-18 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. They will be used that way in this document.

Advisory and closure standards: The “Advisory” standard of 235 CFU/100mL *E.coli* in surface water was adopted based upon data from three EPA studies conducted in the late 1970s and published in their Recreational Water Quality Criteria document in 1986 (References 1 through 3). These studies indicated 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 EPA recommendations and they were reaffirmed in a revisiting of the issue in 2002 (Reference 4).

The epidemiological studies indicated that a level of 235 CFU corresponded to approximately 8 cases of gastrointestinal illness per 1,000 recreational water users. DNR adopted 1000 CFU *E.coli*/100mL as a “Closure” level based upon data from these studies indicating that this represents a risk of approximately 14 cases of gastrointestinal illness per 1,000 recreational water users.

When EPA issued its revised Recreational Water Quality Criteria in 2012 (Reference 5), it drew upon additional studies conducted between 2002 and 2007 using new analysis methods and a broadened definition of gastrointestinal illness. The studies were also conducted in waters impacted by sources of human waste. Using these more conservative parameters, EPA determined that an *E. coli* level of 235 CFU/100 mL corresponds to 36 cases of gastrointestinal illness per 1,000 swimmers. Using EPA’s translation factor for the revised criteria (Reference 6) indicates that 1,000 CFU/100 mL corresponds to roughly 63 cases of illness per 1,000 swimmers. EPA suggested that an *E. coli* level of 235 CFU/100 mL could be used as a Beach Action Value (BAV) for posting beach advisories based on single water samples.

Why is *E.coli* used as the indicator bacteria instead of Enterococci?

In the study listed as Reference 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, DNR conducted a study in 2003 in which 3 state park beaches were monitored for *E.coli* and Enterococci. *E.coli* yielded the most reliable and consistent results in this study.

References

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

- 5) EPA. 2012. [Recreational Water Quality](#) Criteria U.S. Environmental Protection Agency. EPA-820-F-12-058.
- 6) Wymer, L. et. al, 2012. [Appendix A: Translation of 1986 Criteria Risk to Equivalent Risk Levels for Use with New Health Data Developed Using Rapid Methods for Measuring Water Quality](#). EPA-820-F-12-058.