



Oregon Department of Environmental Quality

# Bacteria Indicator Method Updates for 2024

## Water contact recreation – freshwater and marine water

To: DEQ WQ Staff

From: DEQ WQ Assessment Program

Date: Sept. 20, 2022

## Objectives of the methodology update

### *Freshwater contact recreation*

Freshwater streams that flow directly into the ocean are currently assessed using the freshwater indicator bacteria, *E. coli*. DEQ's Oregon Beach Monitoring program typically samples using the enterococcus indicator to evaluate whether beach advisories should be posted due to elevated bacteria levels. This monitoring typically includes sampling freshwater streams crossing the beach to protect recreators and identify potential sources of bacteria. DEQ is proposing to update the current assessment method for bacteria to include the use of either *E. coli* or enterococcus as the indicator for water contact recreation use assessment on these freshwater streams that flow directly into the ocean. This update will result in DEQ using more available data.

### *Coastal water contact recreation*

The current method for assessing the threshold value for coastal water contact bacteria indicator still uses the raw score method in a 90-day period. In practice, this means that one exceedance in a 90-day period can trigger an impaired water designation. DEQ will revise the method to use the binomial 10% exceedance rate to be consistent with assessment of other conventional freshwater parameters. Using the binomial test will provide greater statistical confidence to listing and delisting conclusions.

## Background

Bacteria related to fecal sources can impair beneficial uses of water for recreation, fishing and shellfish harvesting. Oregon has established water quality standards with relevant bacterial indicators for specific designated uses and water types (Table 1). Recreational water quality criteria include two components: 1) a geometric mean; and 2) a "statistical threshold value," which may not be exceeded in more than 10 percent of samples during the averaging period.

**Table 1. Bacterial indicators and criteria**

Designated use	Bacterial indicator	Criteria metric (CFU / 100 mL)	Threshold Value (CFU / 100 mL)
Freshwater contact recreation	<i>E. coli</i>	Geometric mean $\leq$ 126	No more than 10% > 406*
Coastal water contact recreation	Enterococcus	Geometric mean $\leq$ 35	No more than 10% > 130
Shellfish harvesting	Fecal coliform	Median $\leq$ 14	No more than 10% > 43

For the 2018/2020 Integrated Report, DEQ adopted the binomial statistical hypothesis testing approach to derive a critical number of sample excursions (single measurement that does not meet numeric WQ criteria). This approach scales proportionally with the number of representative samples to evaluate beneficial use

attainment status of water bodies<sup>1,2</sup>. This methodology is used for the assessment of the threshold value for freshwater contact recreation with the averaging period being the IR data window (typically five years). The binomial method allows DEQ to quantify the level of statistical confidence and error when different sample sizes are used for making listing and delisting decisions and eliminates listings based on one single storm event.

As part of DEQ's update to its bacteria criteria in 2016, DEQ clarified which beneficial uses were associated with each of the three different bacterial indicators in the state's water quality standards. When the designated use maps were digitized in 2018, the classification of freshwater bacteria indicator for coastal streams included the portion flowing across the beach of the ocean shore to the mean high-water shoreline.

## Proposed methodology update

### *Freshwater contact recreation*

The sentences in bold will be added to the Designated Use section of the Bacteria chapter in the 2024 Assessment Methodology. This update will include a new bacteria code assigned to portions of freshwater streams that cross beaches to flow directly into the ocean to allow for either bacterial indicator to be used from the mouth of the stream (ocean waters) to the upper extent of National Hydrography Dataset Reach Code.

*Water contact recreation is broadly designated in Oregon. Unless designated otherwise, the E. coli criteria are applicable in all freshwaters throughout the state to protect this use. Coastal water contact recreation is designated for parts of estuaries and Oregon's territorial adjacent marine waters up to three miles offshore. For these more saline waters (beaches and areas of estuaries), enterococcus is the applicable indicator of fecal contamination.*

***For freshwater streams that flow over beaches directly into the ocean, enterococcus can be used as a bacterial indicator to assess the support of the freshwater contact recreation use when there is insufficient E. coli data in an assessment unit. If both indicators have sufficient data in an assessment unit, E. coli will be used for evaluating freshwater contact recreation use and enterococcus data will not be included in the assessment.***

### *Coastal water contact recreation*

Updated language to be consistent with the freshwater method for assessing the 10% threshold value.

#### **Category 5: water quality limited, TMDL needed (303(d) list)**

*A 90-day geometric mean greater than 35 Enterococci organisms per 100 mL **OR** more than 10 percent of all samples within the IR data window exceed 130 enterococci organisms per 100 mL according to the exact binomial test, based on the minimum sample size identified in the binomial table.*

#### **Category 4: water quality limited, TMDL not needed**

*TMDLs needed to attain applicable water quality standards have been approved (Category 4A), other pollution control requirements are expected to address pollutant and will attain water quality standards (Category 4B), or impairment is not caused by a pollutant (Category 4C).*

#### **Category 3: insufficient data**

---

<sup>1</sup> EPA, 2002. [Consolidated Assessment and Listing Methodology \(CALM\) Toward a Compendium of Best Practices, First Edition](#). United States Environmental Protection Agency. July 2002. Chapter 4.

<sup>2</sup> <https://www.oregon.gov/deq/FilterDocs/ir-statmethods.pdf>

*Insufficient data are available for evaluation of a 90-day geomean, and the IR window contains less than eight samples with no single sample greater than 130 enterococci organisms per 100 mL.*

### **Category 3B: insufficient data; potential concern**

*Insufficient data are available for evaluation of a 90-day geomean, and the IR window contains less than eight samples with one or more samples exceeding 130 enterococci organisms per 100 mL **OR** the Oregon Beach Monitoring Program has issued one or more advisories based on monitoring results for enterococci, not including precautionary advisories.*

### **Category 2: attaining**

*All 90-day geometric means are less than or equal to 35 enterococci organisms per 100 mL, **AND/OR** the IR window contains eight (as outlined in the Determining Attainment section) or more samples and  $\leq 10\%$  of all samples exceed 130 enterococci organisms per 100 mL according to the exact binomial test.*

## **Implementation**

The U.S Environmental Protection Agency's 2012 recreational water quality criteria recommends *E. coli* and enterococcus are the best bacteria indicators for pathogen related illness in freshwater<sup>3,4</sup>. For freshwater streams determined to be impaired using enterococcus as the bacteria indicator, DEQ expects that permitted discharges which meet limits based on *E. coli* criteria will not cause or contribute to impairments of other fecal bacteria criteria that support water contact recreation use. Additionally, basin scale Total Maximum Daily Loads for *E. coli* also apply to these streams.

## **Conclusion**

These updates to the bacteria assessment methodology will allow DEQ to use more data in coastal freshwater streams resulting in a more robust assessment. Additionally, the use of the binomial test for coastal water contact assessment will increase the confidence in listing streams as impaired for recreational use.

## **Alternative formats**

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email [deqinfo@deq.oregon.gov](mailto:deqinfo@deq.oregon.gov).

---

<sup>3</sup> <https://www.oregon.gov/deq/FilterDocs/BacterialIssuePaper.pdf.pdf>

<sup>4</sup> <https://www.epa.gov/sites/default/files/2015-10/documents/rwqc2012.pdf>