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Elevated Bacteria Levels Occur at Some Monitored Locations

High Bacteria Numbers More Common Downstream of Urban and Suburban Areas

WHY IT MATTERS

Polluted waters can expose people to pathogens. The Maine Healthy Beaches Program collects water samples at public swimming beaches to monitor for concentrations of fecal indicator bacteria, while the Department of Marine Resources (DMR) tracks bacteria in shellfish harvesting areas to assess risks to human health.

Individuals swimming or wading in marine waters can be exposed to pathogens in polluted water, risking gastrointestinal, upper respiratory and eye infections. People who eat bivalve shellfish grown in polluted areas are also at risk, especially for gastrointestinal disease. Bivalves like clams, mussels, and oysters are filter feeders. They can concentrate some pathogens (and algae-derived toxins, not discussed here) in their bodies, posing a risk to anyone consuming contaminated shellfish.

While most infections acquired this way are mild, they can be dangerous for immunocompromised individuals, and serious diseases like hepatitis can also be transmitted.

STATUS & TRENDS

Because methods used by the two agencies to track bacteria levels differ, the numbers they report are not directly comparable. The Beaches program collects data on "enterococci" bacteria (which is a better indicator of risk to swimmers), and DMR tracks "fecal coliform" bacteria.

SWIMMING BEACHES

The Maine Healthy Beaches Program works with participating towns and state parks to track bacteria levels at public marine beaches. Volunteers collect water samples to be analyzed for bacteria concentration. Bacteria levels above the "Beach Action Value" of 104 MPN/100ml (most probable number of enterococci bacteria per 100 milliliters of sample water) may lead to posted advisories or beach closures. Samples are typically collected once a week between Memorial Day and Labor Day, when people are most likely to go swimming.



Six beaches in Casco Bay are monitored from Memorial Day to Labor Day for enterococci bacteria, an indicator of potential health risk to swimmers. Bacteria levels above the single sample safety threshold (104 enterococci MPN/100ml) occurred in about 7% of samples from 2016 through 2019. (Note: The y-axis is on a log scale.) In 2018, 6.6% of samples statewide exceeded that threshold. Elevated bacteria levels are often associated with rain events, freshwater inputs, or point sources of pollution. Stover's Point Beach (in Harpswell) has consistently low bacteria levels. Mackerel Cove (Harpswell) and Willard Beach (South Portland) have the highest average levels.

No Changes Over 15 Years at Two Beaches



Bacteria levels at two urban beaches in Portland and South Portland show no trend over the past 15 years. (Note: The y-axis is on a log scale.) Long-term data is only available from East End Beach and Willard Beach. Neither absolute levels nor probability of exceeding the safety threshold have changed.

Differences in Bacteria Levels Among Beaches

SHELLFISH HARVESTING LOCATIONS

Maine Department of Marine Resources monitors bacteria levels at more than 235 shellfish harvesting areas around Casco Bay. Samples are collected several times a year. The data are used to manage shellfish harvests to protect public health. Harvest areas may be classified as "Approved" for harvest if geometric mean fecal coliform levels are below 14 colony forming units (CFU) per 100 ml, and if no more than the top 10% of samples exceed 31 CFU/100ml (the 90th percentile, or "P90" threshold).

Almost all monitored locations in Casco Bay met the geometric mean standard and most met the P90 threshold as of 2019. However, some areas of the Bay, including most of the waters in the southern Bay near Portland, are permanently closed because of proximity to possible sources of pollution like wastewater treatment facilities and combined sewer overflows. DMR does not collect bacteria data from such areas on a regular basis.

Typical levels of bacteria at all but one sampled shellfish bed remain below the 14 CFU/100 ml geometric mean threshold as of 2019. Only a single site (in the Presumpscot Estuary) failed to meet that condition. But infrequent elevated bacteria levels occur at more monitored locations. Forty seven sites had ten percent or more of recent samples above the 90th percentile threshold of 31 CFU/100 ml. In addition to location, rainfall and time of year affect bacteria levels, with high levels more likely after rain, or during the warmest months of year.

Average Bacteria Levels at Sites Around Casco Bay

Waters adjacent to Falmouth, Cumberland and Yarmouth tend to have higher bacteria levels than waters of the Eastern Bay. Site-to-site differences are large, pointing to possible opportunities to address water quality at a local scale. Data are not available from the most urbanized shores in the southern Bay or from around several islands.



Bacteria Levels Usually Stay Below Thresholds



Sampling Sites Around Casco Bay

SUCCESSES & CHALLENGES

- Bacteria levels in the parts of Casco Bay for which data are available tend to be below the beach notification threshold or shellfish area classification thresholds most of the time. Exceptions are usually associated with rain or other events that transport bacteria to coastal waters.
- Beaches and shellfish beds may be closed preemptively due to heavy rainfall, even in the absence of a sample showing high bacteria levels. Since beach samples are typically collected once a week, and shellfish samples only a few times a year, this precautionary approach protects public health.
- Urban and suburban waters are most at risk. Human activity increases the risk of bacteria levels via stormwater runoff, pet waste, combined sewer overflows, or inadequate sanitation systems. In the Eastern Bay and the islands, aging or failing on-site wastewater treatment systems can be a source of problems.
- DMR generally does not collect bacteria data in areas permanently closed to shellfish harvesting. As a result, limited data are available on bacteria levels precisely where those levels are expected to be highest—adjacent to heavily settled areas and near known sources of possible pathogens like combined sewer overflows or overboard discharges (OBDs).
- OBDs were allowed by Maine Department of Environmental Protection (DEP) as recently as 1987. OBDs discharge filtered and chlorinated human waste to state waters. Because they are not always properly maintained, they sometimes pose a risk of bacterial contamination. Decades of work by DEP and others have reduced active OBDs in Casco Bay from nearly 400 in 1987 to only 95 as of 2020.