

2025

Massachusetts Beach Testing Results: Annual Report



Winthrop Shore Reservation Winthrop, MA

Photo by Logan Bailey

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Executive Summary

Swimming is one of the most popular recreational activities in Massachusetts (EOEEA, 2017), with over 111 million individual trips to coastal beaches annually (EOEEA, 2007). Each year, the Massachusetts Department of Public Health (DPH), Bureau of Climate and Environmental Health's Division of Environmental Toxicology, Hazard Assessment and Prevention collects beach water quality data from local health departments and the Massachusetts Department of Conservation and Recreation. This report provides a description and summary of that information.

- **Water quality:** In 2025, a total of 16,021 water samples were collected from 594 marine and 568 freshwater beach sampling locations. These locations represent 572 marine and 529 freshwater beaches statewide, with 100% of marine and 98% of freshwater beach communities reporting water quality information to DPH. Approximately 4.0% of marine samples and 3.9% of freshwater samples exceeded the Massachusetts bacterial water quality standards for beaches (described on page 2). Exceedances in 2025 were slightly below the overall low historical exceedance rates for Massachusetts beaches. Elevated bacteria accounted for 94% of beach posting days for poor water quality at marine beaches; additional reasons for notifications included rainfall (typically associated with elevated bacteria) and combined sewer overflows (CSOs). At freshwater beaches, 62% of beach posting days were due to elevated bacteria and 38% due to cyanobacterial harmful algae blooms.
- **Field data:** In 2025, nearly all water samples (99%) submitted to DPH had accompanying field data. Recent rainfall was identified as the most important factor contributing to elevated bacteria levels at recreational waterbodies. As in previous years, the exceedance rate was greatest in the 24 hours following rainfall, with the relationship most pronounced at marine beaches. Pollution sources, particularly the presence of larger numbers of birds at marine and freshwater beaches, were also associated with higher levels of bacteria.
- **Public notification:** The online [Interactive Beaches Water Quality Dashboard](#) includes data from all marine and freshwater beaches in the state. Between Memorial Day and Labor Day, the dashboard attracted over 270,000 page views. Individuals are also notified of unsafe conditions at beaches by physical signage that beach operators are required to post. In 2025, 98% of marine and 87% of freshwater beaches complied with the public notification requirements. Compliance for both marine and freshwater beach postings improved in 2025 compared to 2024.

Introduction

Health risks to swimmers associated with poor water quality have been documented in numerous studies (Marion et al., 2010; Wade et al., 2003). Beachgoers may be exposed to pathogens through recreational activities in and around polluted waterbodies (Hlavsa et al., 2015). In the United States, most swimming-associated illnesses are caused by a variety of pathogens associated with fecal contamination (Cabelli et al., 1982; USEPA, 2012). Fecal matter can enter beach water in a variety of ways: sewage treatment system failures, combined sewer overflows, discharge of sewage by boats, re-suspension of sediments, and rainfall with resulting surface runoff (Galfi et al., 2016; Rodrigues et al., 2016).

To minimize swimming-associated illness and injury and to notify the public about the quality of beach water, DPH regulations require regular water quality monitoring and public notification of unsafe conditions. All public and semi-public bathing beaches in Massachusetts are monitored for fecal indicator bacteria (FIB), and on occasion, harmful algae. Monitoring occurs during the beach season which typically begins the weekend of Memorial Day and ends during the weekend of Labor Day.

DPH adopted the U.S. Environmental Protection Agency (USEPA) criteria for enterococci and *E. coli* in marine- and fresh-waters in 2001. These criteria consist of both a single sample and geometric mean (geomean) value reported as colony forming units per 100 milliliters of water (CFU/100 mL) (see Table 1). When beach water exceeds these water quality standards, DPH requires that the beach be posted with a notice alerting the public to the possible risk of swimming.

At most beaches in Massachusetts, water quality is considered unacceptable when two samples collected on consecutive days exceed the water quality standards. This approach is consistent with DPH regulations and has helped to minimize the impact of beach closures on vulnerable socio-economic populations, whose local beach may be the only accessible means of recreation during the summer.

Beach Type	Indicator	Single Sample	Geomean
Marine	Enterococci	>104	>35
Freshwater	Enterococci	>61	>33
	<i>E. coli</i>	>235	>126

Table 1. DPH recreational water quality criteria (CFU/100 mL).

Some of the highest use beaches operated by the state are in the urban areas of Boston, Lynn, Quincy, and Revere. Beaches with a history of multi-day elevated bacteria levels are required to post after a single exceedance. Posting is also required when the geomean of the five most recent samples exceeds the geomean standard.

In addition to water samples, field data such as days since rainfall and potential pollution sources are required to be recorded at the time of sample collection. Field data facilitate the interpretation of bacteria data and can improve the understanding of water quality at the local and state level.

Water Quality

Marine beach exceedances During the 2025 beach season, 8,465 samples were collected and analyzed from 594 marine sampling locations in the 60 communities with marine beaches. Of these 594 locations, 145 (24.4%) had at least one bacterial exceedance. A total of 339 out of the 8,465 samples exceeded the 104 CFU/100 mL standard bringing the percentage of sample exceedances for marine waters to 4.0%. The 2025 exceedance rate is lower than the historic average (5.3%) (Figure 1).

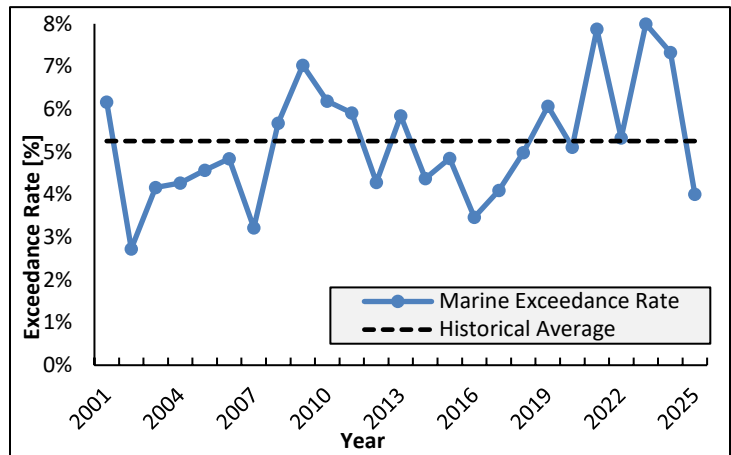


Figure 2. Marine beach sample exceedance rate (2001 - 2025).

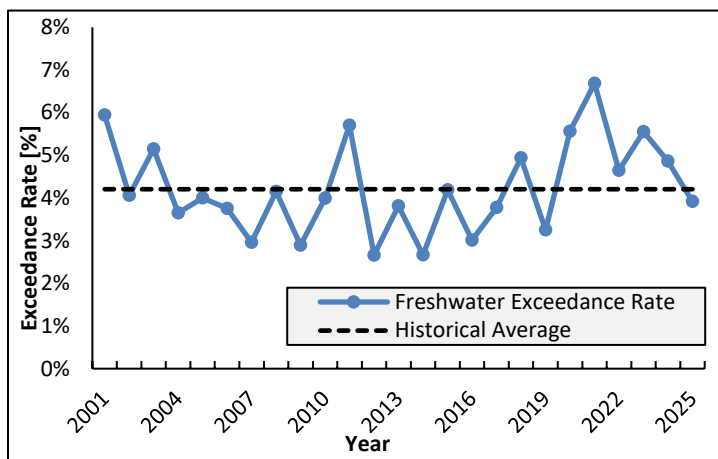


Figure 3. Freshwater beach sample exceedance rate (2001 - 2025).

Freshwater beach exceedances During the 2025 beach season, 7,556 samples were collected and analyzed from 568 freshwater sampling locations in the 177 communities reporting freshwater beach data. Most freshwater beaches (88%) used *E. coli* as the fecal indicator bacteria, with the other 12% using *Enterococci*. Among the 568 freshwater locations, 138 (24.3%) had at least one bacterial exceedance. A total of 296 out of 7,556 samples (3.9%) exceeded the single sample standard, which represents an exceedance rate slightly below the historic average exceedance rate of 4.2% (Figure 2).

Posting beaches Of the 1,101 beaches operating in 2025, 184 (16.7%) posted no swimming signs on one or more days during the season. In total, there were a combined 3,345 posting days in 2025, with the majority of posting days due to the exceedance or expected exceedance (e.g., rainfall) of a water quality standard. For marine beaches, there were 1,014 total posting days due to elevated bacteria (94%), rainfall (1%), combined sewer overflows (CSOs) (4%), or other reasons (1%) (Figure 3). For freshwater beaches, there were 2,331 posting days due to elevated bacteria (62%), cyanobacterial harmful algal blooms (38%), or other reasons (<1%) (Figure 3). The “other reasons” category included lack of testing and construction work.

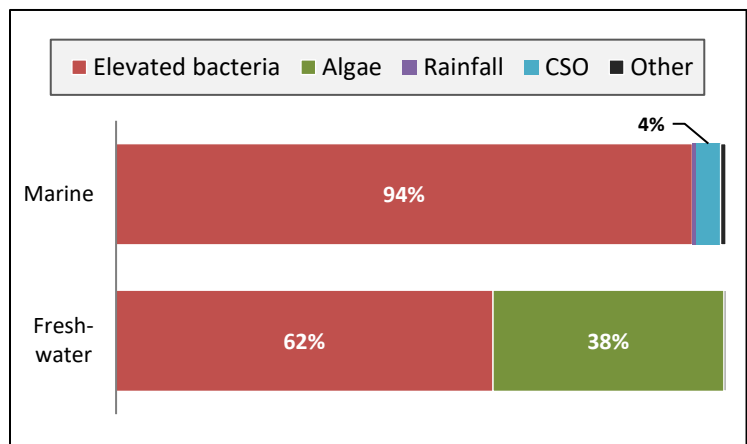


Figure 4. Posting details for marine and freshwater beaches in 2025

Rainfall Rainfall is recognized as one of the major drivers of bacterial exceedances in beach water (Harder-Lauridsen et al., 2013). Historically, overall exceedances at both marine and freshwater beaches generally rise and fall with the total amount of summer rainfall, with some exceptions. This pattern was observed in 2025, with exceedance rates at both marine and freshwater beaches declining from the previous year corresponding with less summer precipitation (Figure 4). The rainfall data were obtained from the National Oceanic and Atmospheric Administration (NOAA, 2025). Data sets from two coastal communities, Boston and Hyannis, were used to represent monthly rainfall amounts at marine beaches. For rainfall at freshwater beaches, data sets from Amherst and Ashburnham, along with those from Boston and Hyannis, were used to represent monthly rainfall across the state.

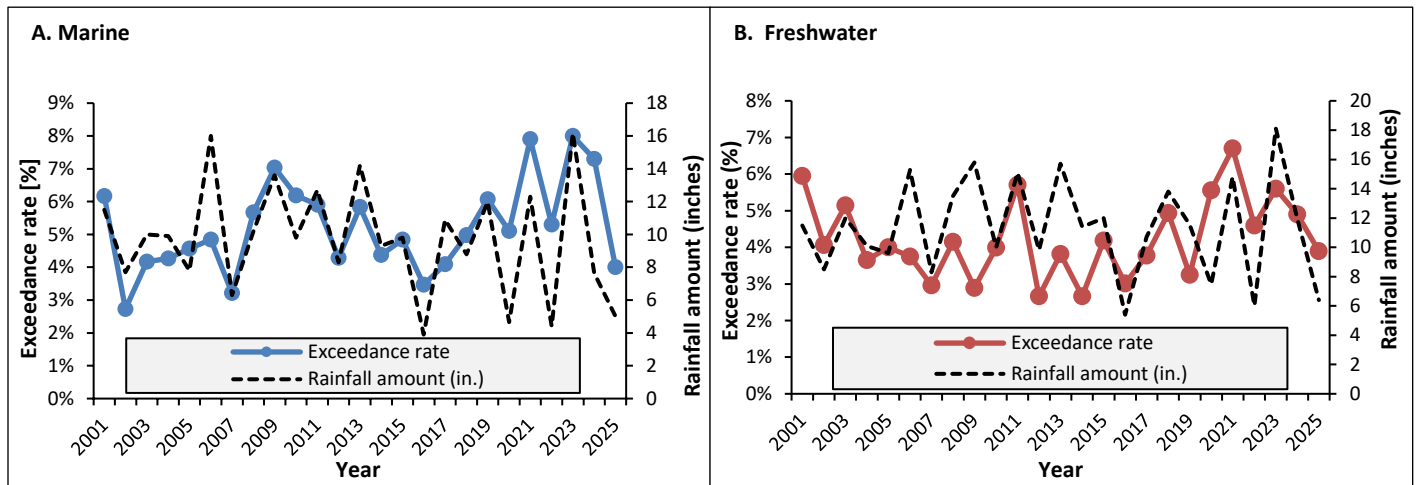


Figure 4. The historical relationship between rainfall amounts and exceedance rates at (A) marine and (B) freshwater beaches.

Exceedances typically drop as time between rainfall and sample collection increases. For marine beaches in 2025, samples collected within 24 hours following rainfall were most likely to exceed the state standard (Figure 5). In contrast, freshwater beaches showed no quantifiable relationship between sample exceedance rate and days since rain in 2025 (Figure 5).

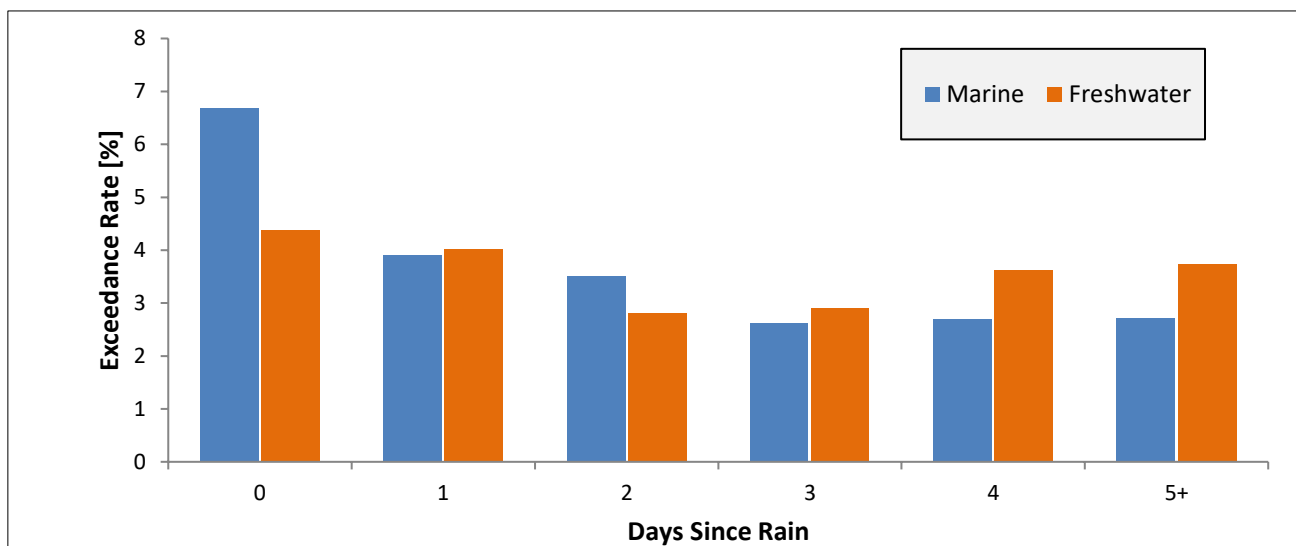


Figure 5. Relationship between the exceedance rate and days since rainfall in 2025.

Cyanobacteria Harmful Algal Blooms Cyanobacteria (sometimes called blue-green algae) occur naturally in freshwater. Under certain environmental conditions, they can multiply quickly, creating a highly concentrated area known as a cyanobacterial harmful algal bloom, or cyanoHAB. Some HABs produce toxins (known as cyanotoxins) which can be harmful to human and animal health. People and animals can be exposed to cyanobacteria through direct skin contact, ingestion, or inhalation; symptoms range from skin irritation to neurological and liver damage (DPH, 2019). In 2025, 78 cyanoHAB public health advisories were issued across 67 recreational waterbodies in Massachusetts. This total includes waterbodies with permitted beaches as well as those used for non-swimming recreational activities, such as boating, rowing/paddling, and fishing.

Over the past six years, the number of beach closure days due to cyanoHABs have fluctuated, usually following similar fluctuations in average summer rainfall (Figure 6). During the drought of 2022, cyanobacteria advisories only resulted in 252 total beach closure days, while during the historically wet summers of 2021 and 2023, cyanobacteria advisories caused 896 and 752 closure days, respectively. Conversely, despite declines in rainfall in 2024 and 2025, there were 863 and 883 respective total beach closure days due to cyanobacteria. These two years indicate a departure from the trend in prior years, showing steady, relatively high closure days despite decreased rainfall. There is an ongoing effort to understand the relationship between rainfall and cyanoHAB occurrence.

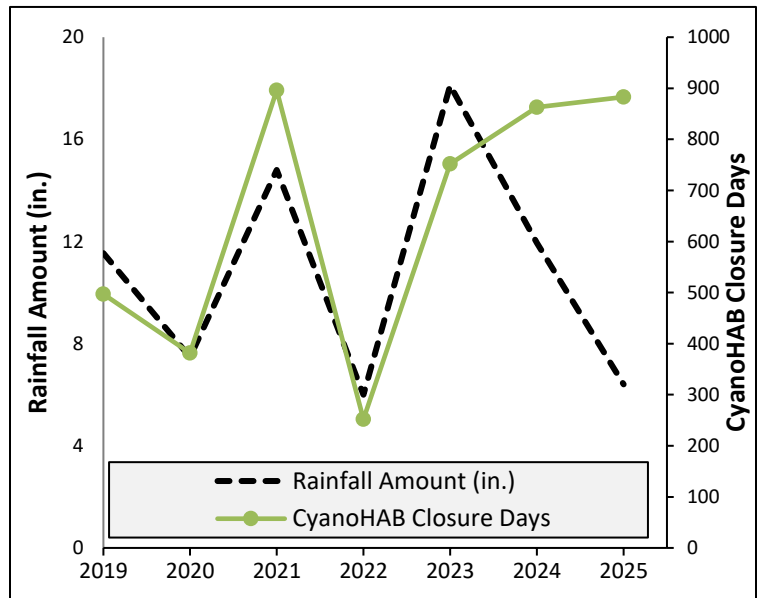


Figure 6. Relationship between average rainfall and the total number of beach closures due to cyanobacteria advisories (in days).



Plum Island, Newburyport, MA
Photo by Kate Adams

Potential pollution sources Starting in 2017, beach operators were asked to report the number of swimmers, birds, and dogs present in the water when a sample was collected. Figure 7 shows the mean bacteria levels of samples at marine and freshwater beach locations in 2025 compared to the number of reported swimmers, birds, and dogs. The data indicate that the presence of larger numbers of birds was associated with increases in bacteria levels at marine and freshwater beaches. No clear relationship was observed between bacteria levels and the number of dogs present. The highest concentrations of humans were associated with increases in bacteria at freshwater beaches, but not at marine beaches. Enterococci results at freshwater beaches were not included in this analysis due to the low number of samples.

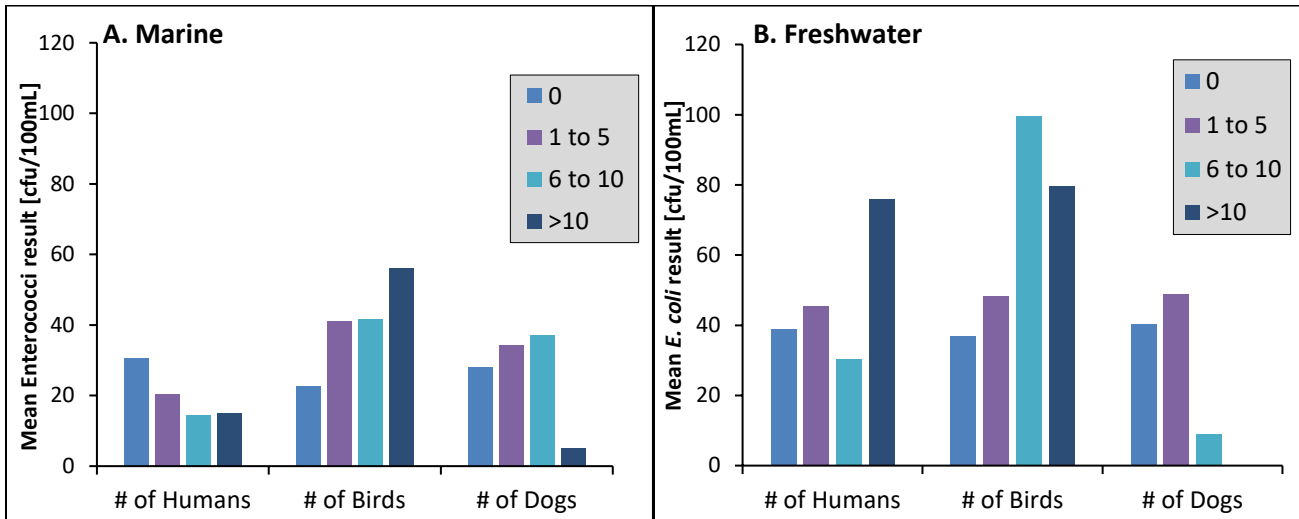


Figure 7. Mean bacteria levels and numbers of birds, dogs, and humans at marine and freshwater beaches in 2025.

Environmental Justice Communities

Beach access and water quality are particularly important in environmental justice (EJ) communities, as these communities are disproportionately affected by the increased presence of environmental hazards and poor health outcomes (DPH, 2017). For example, EJ communities are characterized by high population densities, low income, and high levels of non-vehicle ownership. Individuals in these communities, compared to other areas in the state, are more likely to rely on a local beach as a place to cool off during extreme heat events. For this analysis, beaches were identified as close to an EJ neighborhood if they were within 0.25 miles of an EJ block group – with 0.25 miles being the standard definition for “walking distance” used in urban planning (Yang and Diez-Rous, 2012).

In 2025, 25.0% of Massachusetts beaches were located in or close to an EJ neighborhood, based on the EJ census block group map from the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA, 2024), a similar percentage to beaches open in 2024 (24.8% close to EJ neighborhood).

The bacterial exceedance rate for marine beaches close to an EJ neighborhood was twice as high as the exceedance rate for marine beaches not located close to an EJ neighborhood (Figure 8). This exceedance rate gap was similar to the relationship at marine beaches in 2024 (DPH 2025).

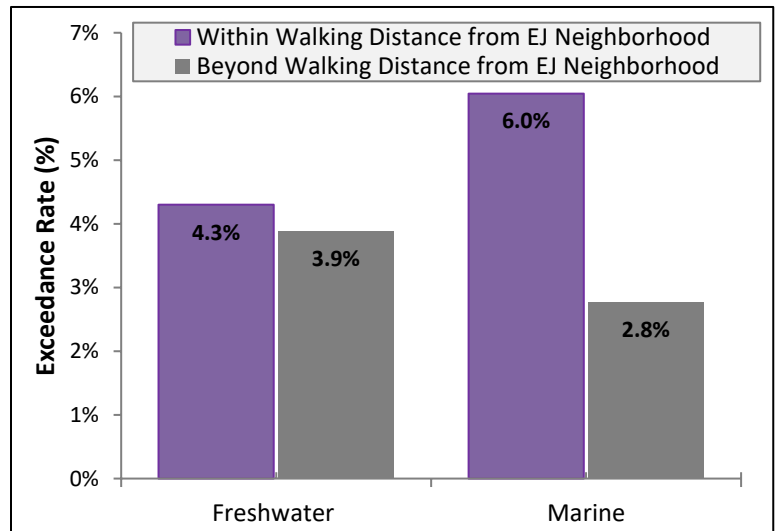


Figure 8. Relationship between 2025 sample exceedance rate and proximity to EJ Neighborhoods.

In contrast, freshwater beach exceedance rates were similar for both groups in 2025 after showing slightly higher rates at beaches close to EJ neighborhoods in 2024. As discussed previously, decreased rainfall in 2025 compared to 2024 is likely the largest driver in the overall decrease in exceedance rates between the two years, though the effect was more pronounced for marine beaches than freshwater beaches.

Coastal Resilience

The [Resilient Coasts Initiative](#), a priority action identified as part of the 2023 statewide ResilientMass Plan, is an effort led by the Massachusetts Office of Coastal Zone Management (CZM) to address sea-level rise, erosion, and coastal flooding by developing a comprehensive statewide strategy for coastal resilience to guide state and local policy and management actions on the coast. As part of this initiative, 15 Coastal Resilience Districts were defined to inform regional collaboration. Within these districts, municipalities share similar coastal features, risks, and can coordinate solutions.

A total of 585 (53%) swimming beaches operating in 2025 were located within a Coastal Resilience District. Coastal Resilience Districts in the Boston area and the Massachusetts North Shore had generally higher bacterial exceedance rates in 2025 than other Coastal Resilience Districts in the state (Figure 9).

Map ID	District Name	# of Beaches	Exceedance Rate
1	Lower Merrimack	N/A	N/A
2	Great Marsh	15	3.4%
3	Mid-North Shore	55	5.8%
4	Saugus Watershed	18	8.9%
5	Mystic-Charles Watersheds	10	7.1%
6	Boston Harbor Islands	3	0.0%
7	Neponset-Weir Watersheds	39	7.2%
8	Mid-South Shore	24	3.1%
9	Manomet-Sagamore	2	0.0%
10	North Cape Cod	93	3.8%
11	Outer Cape Cod	32	2.7%
12	South Cape Cod	101	1.8%
13	Islands	63	3.7%
14	Buzzards Bay	124	1.5%
15	Taunton Watershed	6	3.0%

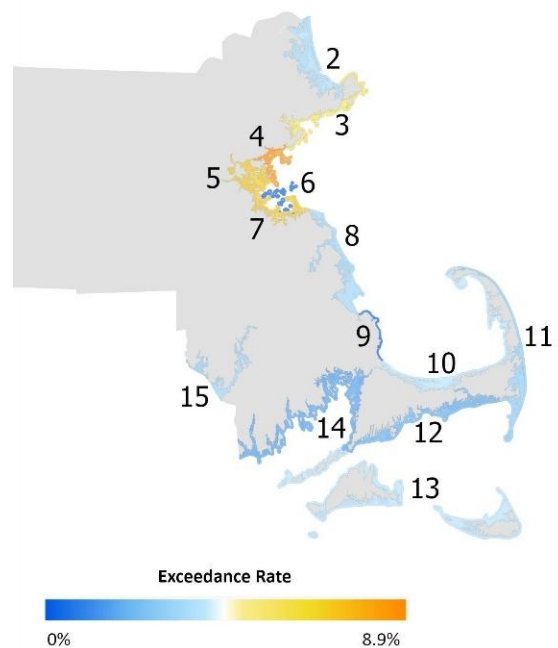


Table 2 & Figure 9. Total sample bacterial exceedance rates shown by Coastal Resilience Districts. District 1, Lower Merrimack, does not have any swimming beaches and is not shown on the map. The associated chart details the district number and name, number of beaches within, and the 2025 bacterial exceedance rate for all samples taken within that district.

Public Notification

Beach website In 2024, DPH expanded the online beach water quality dashboard (<https://www.mass.gov/info-details/interactive-beach-water-quality-dashboard>) to include both marine and freshwater beaches, thus providing the public with statewide, up-to-date beach testing data and beach posting information in an accessible, easy-to-use format. The 2025 beach season was the second year the dashboard operated with this expanded functionality. The online beach water quality dashboard was the most-viewed online dashboard out of all MDPH dashboards. It was viewed over 270,000 times during the 2025 beach season. The highest traffic occurred around the July 4th holiday and during the weekend of August 15-17th. The 2025 dashboard traffic volume was lower than in 2024, likely due to increased press coverage of the dashboard in 2024 compared to 2025.

The dashboard displays data reported to DPH by local health departments, beach operators, and testing laboratories through DPH’s beach data portal, which was developed in 2023. Many critical improvements were made to the portal in 2024 and 2025 to streamline the data submission process and to more clearly communicate required actions to local health and beach operators based on their most recent water quality results. These improvements enable quicker and more accurate public notification of beach data results and postings. Portal user feedback and behavior data are analyzed each year to inform ongoing improvements.

Beach postings When water quality standards are exceeded or other safety concerns exist, beach operators are required to post signage at the beach advising individuals of the hazard and recommending they stay out of the water. This is an essential part of the public notification system. Based on posting data reported to DPH, marine and freshwater beaches were posted properly 98% and 87% of the time, respectively. Compliance for both marine and freshwater beach postings improved in 2025 compared to 2024, possibly because of targeted outreach performed by DPH to specific towns with freshwater beaches after the 2024 season. As in 2024, the lower compliance rate at freshwater beaches may be at least partially due to reporting failure, rather than a public notification failure, as the missed posting reports come from a small number of towns. As previously noted, compliance increased compared to 2024 after outreach by DPH, and DPH will continue to work with towns with the lowest compliance rates this coming season to improve reporting.

Conclusions

In 2025, the exceedance rates at both marine and freshwater beaches were below the historical average. Though multiple factors contribute to exceedance rates, amount of in-season rainfall is typically most strongly associated with exceedance rates. The 2025 season was one of the driest summers of the last 25 years. Average historical exceedance rates of 5.3% at marine beaches and 4.2% at freshwater beaches indicate that the state has beaches with generally good water quality. Elevated bacteria levels, rainfall events, CSO discharges, and cyanobacterial harmful algal blooms were the primary drivers of beach posting days for poor water quality. Public notification of beach testing results and postings via DPH’s dashboard was a highly utilized means of communicating with the public.

Acknowledgements

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Nahant Beach, Nahant, MA
Photo by Logan Bailey

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For more information, please visit:
DPH Beaches website: <http://www.mass.gov/beaches>
DPH Interactive Beach Dashboard: <http://www.mass.gov/beachdata>
DPH Algae website: <http://www.mass.gov/dph/algae>

Or contact:

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Duxbury Beach, Duxbury, MA

Photo by Mandy McNeill