

Maine Healthy Beaches (MHB) Program Risk Assessment Matrix

Scope and Application

A Risk Assessment Matrix (RAM) is a preliminary evaluation of water quality trends and potential sources of fecal bacteria pollution impacting a marine beach. This risk-based ranking system is used to help classify Maine's coastal, marine beaches into “tiers”¹, improve understanding of the risk of fecal contamination at participating beaches, and better define a worst-case scenario for water quality conditions at those beaches. It is meant to be used in conjunction with routine monitoring, special studies projects, and sanitary surveys to build a profile of each beach participating in the MHB program. A RAM may also help determine the need for in-depth pollution source tracking and/or the need for separate beach management areas (BMAs).

Beach Management Areas

A BMA represents an entire beach, or segment of a beach, that is managed independently from other segments or nearby beaches. Implementing separate BMAs allows management decisions to be made for a specific region of the beach, rather than treating the entire beach as one unit. Each BMA has its own beach sign(s) posted at major access points and is listed separately on the MHB website.

Completing a RAM for the entire beach can help beach managers determine if division of a larger beach area into separate, distinct BMAs is warranted. Reasons to implement separate BMAs include, but are not limited to:

- The beach is heterogeneous and conditions vary considerably (e.g., a river mouth or storm increases the likelihood of bacterial pollution at a specific location on the beach). This includes large beach areas where water quality monitoring results are not consistent along the entire length of beach.
- Timely monitoring and public notification of conditions is not practical for the entire beach. This may apply to areas not promoted for public use including privately owned areas, areas not serviced by lifeguards, areas that lack public access, or those deemed unsafe or unsuitable for recreational purposes.
- One section of the beach experiences more public use compared to other areas.
- A beach has historically informal names or sections known to the public.

Completing the RAM

A RAM should be completed for each BMA. The RAM should be updated every 5 years, or more frequently if water quality conditions change, new pertinent information is available, there has been new development or an increase in activities posing a risk to water quality, there have been changes in the designated use of the waterbody, etc. Each BMA has a unique set of factors or characteristics impacting water quality and completion of the RAM helps determine what those factors are.

¹ The “tier” classification determines the beach’s monitoring frequency, need for a more in-depth assessment of possible fecal pollution sources and environmental conditions, etc.; See MHB Tiered Monitoring Plan

If routine monitoring demonstrates bacteria levels that are consistently above established safety criteria, simply examining the areas/properties directly on or adjacent to the beach may not be a sufficient investigation of actual and potential sources of fecal contamination impacting the beach. More in depth investigations may include: monitoring of freshwater inputs; property and septic system inspections within the larger beach drainage (i.e. watershed); smoke, dye, and camera testing to determine the integrity of sewer and/or stormwater infrastructure; and investigating other factors likely contributing to poor water quality (e.g., boats dumping waste, proximal habitat use by wildlife, etc.). Removing sources of bacterial pollution can result in measurable improvements in water quality.

Before conducting any field assessments, read through the RAM, become familiar with the assessment process, and ensure access to resources necessary to complete the exercise. Obtain copies of data and reports specific to each beach management area such as previous sanitary surveys, watershed surveys, special studies results, etc. Integrate the expertise and knowledge of local code enforcement officers, plumbing inspectors, wastewater treatment and public works staff, local planners, conservation commissions, etc.

- ✓ For sections I-VI, complete each question and enter the total points in the summary below each.
- ✓ Refer to the Definitions (page 10) for terms used in the RAM.
- ✓ Summarize the section totals and enter this value in the **Final Score Box, Section VII page 10**.
- ✓ This final RAM score corresponds with the RAM ranking system below.

RAM Ranking System

The final RAM score corresponds to a ranking associated with recommendations. Beach rankings are meant to be used as a *guideline* to help communities and resource managers assess recreational water quality and identify potential bacterial pollution sources in support of public health protection at local beaches.

Two examples of using the RAM in making beach management decisions:

- Bacteria results are slightly above the established safety limit, there is no known hazard (e.g., malfunctioning septic, sewage treatment plant overflow), the conditions are not the typical “worst-case scenario,” and the **Beach Ranking = A**. The beach manager may choose to wait for resample results before posting a Contamination Advisory.
- The same conditions as above, but the **Beach Ranking = D**. The beach manager posts a Contamination Advisory immediately following exceedances of bacterial safety criteria and issues a preemptive Precautionary Rainfall Advisory (PRA) based on local precipitation.

Beach Rankings and Recommendations

A. (0-50 points) Suggested Action: Monitor once per week (or less) during the MHB monitoring season. Post a Contamination Advisory and resample when bacteria results exceed established safety criteria. If there are rivers, streams or storm drains near the beach, post a PRA when the local rainfall level exceeds the recommended threshold (MHB recommends PRAs when rainfall levels exceed 1 inch within 24 hours). Routinely update the RAM and take precautionary actions to maintain healthy

beach conditions including routine septic system inspections, reducing runoff by planting buffers and minimizing impervious surfaces within the coastal watershed, ensuring adequate pump-out facilities for boats, etc. Engage in education and outreach efforts that promote healthy sanitary practices at the beach and throughout the coastal watershed.

B. (51-100 points) Suggested Action: Monitor once per week (or more) during the monitoring season. Post a Contamination Advisory and resample when bacteria results exceed established safety criteria. Post a PRA when the local rainfall level exceeds the recommended threshold (MHB recommends PRAs when rainfall levels exceed 1 inch within 24 hours). Post a Contamination Advisory or Closure when there are known contamination events (e.g., broken sewer, leaky septic). Routinely update the RAM and take precautionary actions to maintain healthy beach conditions including routine septic system inspections, reducing runoff by planting buffers and minimizing impervious surfaces within the coastal watershed, ensuring adequate pump-out facilities for boats, etc. Engage in education and outreach efforts that promote healthy sanitary practices at the beach and throughout the coastal watershed.

C. (101-150 points) Suggested Action: Monitor once per week (or more) during the monitoring season. Post a Contamination Advisory and resample when bacteria results exceed the established safety criteria. Post a PRA when the local rainfall level exceeds the recommended threshold (MHB recommends PRAs when rainfall levels exceed 1 inch within 24 hours). Post a Contamination Advisory or Closure when there are known contamination events (e.g., broken sewer, leaky septic). Additional monitoring of freshwater inputs or other high-risk areas may be warranted. When feasible, examine the relationship between bacteria levels and other parameters (e.g., rainfall, tidal stage, seaweed, bather load). Routinely update the RAM and take precautionary actions to maintain healthy beach conditions including routine septic system inspections, reducing runoff by planting buffers and minimizing impervious surfaces within the coastal watershed, ensuring adequate pump-out facilities for boats, etc. Engage in education and outreach efforts that promote healthy sanitary practices at the beach and throughout the coastal watershed.

D. (151+ points) Suggested Action: When feasible, increase the frequency of monitoring and the number of sites on the beach and/or in high-risk areas (e.g., river mouth, storm drain, stagnant tide pool). Post a Contamination Advisory and resample when bacteria results exceed the established safety limit. Post a PRA when the local rainfall level exceeds the recommended threshold (MHB recommends PRAs when rainfall levels exceed 1 inch within 24 hours). Consider keeping the BMA posted under an advisory until bacteria levels are consistently within acceptable limits. Post a Contamination Advisory or Closure when there are known contamination events (e.g., broken sewer, leaky septic). Post educational signage or flags at the beach alerting the public to potential health risks associated with recreational use during wet weather or other potential pollution pathways (e.g., “wading in stagnant tide pools or swimming in river mouths is not recommended due to consistently elevated bacteria levels”). Examine all bacterial pathways to the beach and, when feasible, conduct an in-depth wastewater assessment (i.e., survey of sewer and septic systems) of the shoreline and adjacent areas. Identify and remediate pollution sources. Engage in education and outreach efforts that promote healthy sanitary practices at the beach and throughout the watershed.

Maine Healthy Beaches (MHB) Risk Assessment Matrix

Town /Park: _____ Evaluation Date: _____

Evaluator(s): _____

Title/Department: _____

Beach Name: _____ Beach Site(s): _____

Beach Boundaries: _____

I. Beach History²

Calculate points for each of the following:

1. How many monitoring sites were associated with the following geometric mean levels during the previous season (2020)?

_____ > 35 MPN/100 mL (# sites ____ x 10 points)

_____ < 35 MPN/100 mL (0 points for each site) _____

2. On how many monitoring dates during the previous 5 seasons (2016-2020) did at least one beach site exceed the established safety criteria of 104 MPN/100 mL?

_____ ≥7 times (20 points) _____ 5-6 times (15 points) _____ 3-4 times (8 points)

_____ 1-2 times (5 points) _____ 0 times (0 points) _____

3. Has dry weather monitoring resulted in an exceedance during the past 5 seasons (2016-2020)?

_____ Yes (10 points) _____ No (0 points) _____

4. How often are resamples³ clean?

_____ <70% of the time (10 points) _____ 70-90% of the time (5 points)

_____ >90 % of the time (0 points) _____

5. Were there any illness reports⁴ associated with this beach in the past 3 years?

_____ Yes (20 points) _____ No (0 points) _____

MHB NOTES:

Section I. Total Points:

² Monitoring data available from MHB program upon request.

³ Source: MHB Program Beach Inventory (2006-2020).

⁴ Source: Town records; MHB; ME CDC; also include un-confirmed reports.

II. Human Wastewater

Impact Guidelines:

- *Wastewater infrastructure drains directly to the beach.*
- *Wastewater infrastructure is found within a 1-mile radius of any point on the beach boundary.*
- *Wastewater infrastructure is adjacent to a stream/river that empties within 1 mile of the beach boundary.*

Calculate points for each of the following based on the above impact guidelines:

1. Is there a wastewater treatment plant outfall?
_____ Yes (#outfalls _____ x 25 points) _____ No (0 points) _____
-
2. Is there a sewer system (public or privately owned)?
_____ Yes (0 points) _____ No (25 points) _____
-
3. Are there subsurface wastewater disposal (septic or cesspool) systems that are ≥ 20 years old?
_____ Yes (# systems _____ x 25 points) _____ No (0 points) _____
-
4. Are there combined sewer overflows (CSO)?
_____ Yes (# of CSOs _____ x 25 points) _____ No (0 points) _____
-
5. Are there overboard discharge units (OBD)?
_____ Yes (# units _____ x 25 points) _____ No (0 points) _____
-
6. Is there a marina and/or a mooring field?
_____ Yes (# marinas/fields _____ x 25 points) _____ No (0 points) _____
-

MHB NOTES:

Section II. Total Points:

III. Freshwater Inputs

Impact Guidelines:

- *Freshwater source drains directly to the beach.*
- *Freshwater source drains within a 1-mile radius of any point on beach boundary.*
- *Freshwater input is adjacent to a stream/river that empties within 1 mile of the beach boundary.*

Calculate points for each of the following based on the above impact guidelines. Note the difference in points for each question:

1. Are there rivers⁵ or streams?

_____ Yes (# rivers/streams _____ x 25 points) _____ No (0 points) _____

1a. If yes, is the river or stream listed on the state's 303d list⁶ for impairment with bacteria listed as a pollutant?

_____ Yes (# waterbodies _____ x 15 points) _____ No (0 points) _____

2. Are there stormwater drains or pipes?

_____ Yes (# drains/pipes _____ x 15 points) _____ No (0 points) _____

3. Are there intermittent streams or flows related to rain events only?

_____ Yes (# streams/flows _____ x 10 points) _____ No (0 points) _____

MHB NOTES:

Section III. Total Points:

IV. Domestic Animals/Wildlife

Impact Guidelines:

- *Animals/wildlife are proximal to water that drains directly to the beach.*

⁵ This is a permanent drainage not related to rain events, but it may flow intermittently.

⁶ Source: <http://www.maine.gov/dep/water/monitoring/305b/>.

- *Animals/wildlife are within a 1-mile radius of any point on the beach boundary.*
- *Animals/wildlife are adjacent to a stream/river that empties within 1 mile of the beach boundary.*

Calculate points for each of the following based on the above impact guidelines:

1. Are there domestic animal farms/hobby farms/kennels?

_____ Yes (# of farms/kennels _____ x 10 points) _____ No (0 points) _____

2. Are there marsh or wildlife areas/preserves?

_____ Yes (# areas _____ x 10 points) _____ No (0 points) _____

2a. If yes, does the marsh area drain⁷ to the beach?

_____ Yes (# areas _____ x 10 points) _____ No (0 points) _____

3. Are there farms that spread manure or conduct compost operations?

_____ Yes (#operations _____ x 10 points) _____ No (0 points) _____

MHB NOTES:

Section IV. Total Points:

V. Beach Activities and Characteristics

Calculate points for each of the following:

1. What is the typical number of people that visit any 500-foot stretch of the beach during the time of maximum use (July and August)?

_____ > 50,000 visitors (10 points) _____ 20,000-50,000 visitors (5 points)
 _____ 10,000-20,000 visitors (3 points) _____ < 10,000 visitors (0 points) _____

2. Are there public restrooms located within walking distance of the beach?

_____ Yes (0 points) _____ No (25 points) _____

3. Are there trash cans on the beach?

_____ Yes (0 points) _____ No (3 points) _____

⁷ This includes intermittent drainage that occurs only during/after rain events. Also includes seepage through the beach face.

4. Are dogs allowed on the beach during the months of May – September (Answer “Yes” if dogs are allowed and restricted)?
_____ Yes (10 points) _____ No (0 points) _____

5. Are there large numbers of waterfowl (e.g., gulls, ducks, etc.) regularly present?
_____ Yes (10 points) _____ No (0 points) _____

6. Does more than a small amount of seaweed accumulate⁸ on the beach?
_____ Yes (15 points) _____ No (0 points) _____

7. Do tide pools form on the beach?
_____ Yes (# pools _____x 5 points) _____ No (0 points) _____

8. What is the relative shape of the beach?
_____ Crescent (10 points) _____ Flat (0 points) _____

9. Typically, the summer prevailing winds blow toward shore (sea breeze).
_____ Yes (10 points) _____ No (0 points) _____

10. Is tidal flushing partially restricted by a jetty, pier, dock, breakwater, or other structure?
_____ Yes (10 points) _____ No (0 points) _____

11. Is there a paved parking lot located within 100 ft of the beach boundary?
_____ Yes (# lots _____ x 5 points) _____ No (0 points) _____

12. How many paved roads are within 500 ft of the beach?
(#roads _____x 2 points) _____

MHB NOTES:

Section V. Total Points:

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⁸ This is before any management of seaweed occurs and includes episodic events.

VI. Actions to Improve/Protect Water Quality

Calculate points for each of the following:

1. There's routine inspection and maintenance⁹ of:
 - Subsurface wastewater disposal (e.g., septic, cesspools) systems (10 points) _____
 - Sewer systems¹⁰ (10 points) _____
 - Stormwater systems (e.g., catch basin cleaning, surveys) (5 points) _____

2. An active marine vessel pump-out station is located within 3 miles of the beach.
 (# stations ___ x 5 points) _____

3. Local education/outreach¹¹ regarding best practices (e.g., pumping septic/
 boat waste, dog waste, feeding waterfowl) is conducted. (5 points) _____

4. Local water quality ordinances¹² are in place. (10 points) _____

5. More than half of the beach has a 200-foot vegetative buffer. (5 points) _____

6. Dogs are banned from the beach May-September. (10 points) _____

7. Dog waste bags are provided at beach entry points. (3 points) _____

8. The beach is regularly cleaned and/or seaweed is managed¹³. (5 points) _____

9. There is "green" infrastructure¹⁴ within a mile of the beach. (5 points) _____

MHB NOTES:

Section VI. Total Points:

⁹ Ask Codes Enforcement/Plumbing Inspector if routine inspections of older systems occurs, especially in tidal areas and unsuitable soils. Efforts can include pump-out history investigations, property inspections for malfunctions, dye tests, etc.

¹⁰ Ask Wastewater Department if routine inspection of system integrity (especially for older, tidal areas) is part of the operations and maintenance plan. Inspections may include smoke, dye and camera testing, checking property to system connection, stormwater cross-connection, etc.

¹¹ This includes signage, posters in restrooms, mailings, public service announcements, stormwater events, advertising, etc.

¹² Ordinances can include tax incentives and/or requirements for pumping out septic, required wastewater disposal system replacement at time of property transfer, more stringent setback standards than State requirements, etc.

¹³ For example, raking or mechanical cleaning.

¹⁴ <https://www.epa.gov/green-infrastructure>

VII. RAM Final Score

Section Total Points

- I. Beach History (+) _____
 - II. Human Wastewater (+) _____
 - III. Freshwater Inputs (+) _____
 - IV. Domestic Animals/Wildlife (+) _____
 - V. Beach Activities and Characteristics (+) _____
-

Subtotal Sections I-V _____

- VI. Actions to Improve/Protect Water Quality **Subtract Points (-)** _____
-

Final Score

Note: See **Beach Rankings and Recommendations, pages 2-3.**

Definitions

303(d) List – The 303(d) list identifies impaired waters within the State of Maine, causes and sources of non-attainment of water quality standards, and a timetable for the development of TMDLs (Total Maximum Daily Loads) or other management processes to address non-attainment. Standards refer to specific levels of pollutants, which, if reached or exceeded, are expected to render a body of water unsuitable for its designated use and may adversely affect human health or aquatic life.

Beach Management Area (BMA) – An entire beach or a segment of a beach that is managed independently from other beaches or beach segments due to potential pollution impacts or capacity of management entities to provide notification of water quality monitoring results to the public. Each beach management area has its own beach sign(s), is listed separately on the MHB website, and has its own unique identifier for data submitted to EPA databases.

Closure – Issued by a town/park based on chronically elevated bacteria results or when there are known pollution events or other safety hazards (e.g., sewage treatment plant malfunctions, severe flooding, rip currents, sharks, hazardous surf conditions, and other safety hazards).

Combined Sewer Overflows (CSO) – Discharges consisting of untreated domestic wastewater, industrial and commercial wastewaters, and stormwater runoff. Overflows into receiving waters occur during wet weather when the wastewater volume in combined sewer systems exceeds capacity.

Contamination Advisory – Warning notifying the public when bacteria monitoring results exceed established safety criteria. These are recommendations to avoid water contact at a beach due to an increased risk of contracting a waterborne illness.

Exceedance – To exceed or go above a standard or permissible limit.

Geometric Mean – A measure of central tendency used to account for large value fluctuations (common for bacteria data) by putting less weight on outliers in a data set. Geometric means (geomeans) are calculated using the product of a set of values rather than the sum, as is used to calculate the arithmetic mean (average).

Heterogeneous – Diverse in character or content.

Intermittent Stream – Stream that may flow only during certain times of the year (usually related to spring runoff) or after large rainfall events. Generally, intermittent streams will be narrow, shallow, and have varying flow rates.

Malfunctioning subsurface wastewater disposal systems (e.g., septic, cesspool) – Area of primary concern due to public health issues. Malfunctioning systems are typically detected by: odor; presence of wetland plant species such as cattails in an otherwise normal vegetation area; seepage from the tank or leach field area; mushy areas above the system; indents in the ground or other signs that the tank cover or tank might have collapsed.

Marine vessel pump-out station – Safe and legal method for disposing of human sanitary waste from sanitation devices on marine vessels.

Monitoring Season – Period of time during which MHB program swim beach samples are collected and analyzed. Start and end dates are selected to correspond with the primary period of public use of recreational waters in Maine. Monitoring season length can vary by location as weather and water temperatures vary from region to region. For most beaches in the MHB program, the monitoring season is Memorial Day through Labor Day.

Overboard Discharge (OBD) – A discharge of sanitary wastewater from residential, commercial, or publicly-owned facilities to streams, rivers, or the ocean. OBDs are point discharges and are required to be licensed by the State. OBDs are being phased out by the Maine Department of Environmental Protection.

Precautionary Rainfall Advisory (PRA) – A preemptive advisory issued when local precipitation levels exceed a specified threshold. If a town/park does not have an established threshold, MHB recommends issuing a PRA when local precipitation levels exceed 1 inch within 24 hours.

Risk Assessment Matrix (RAM) – Tool for the preliminary assessment of potential and/or current pollution sources on or adjacent to a beach. The RAM assists beach managers in making well-informed beach management decisions and, in conjunction with routine monitoring, helps build a “profile” of each BMA to determine the need for an in-depth sanitary survey of the shoreline and adjacent watershed.

Sanitary Survey – Survey designed to identify and document sources of fecal pollution affecting water resources (e.g., coastal beaches, shellfish growing areas, and freshwater inputs to these areas). This survey can also include categorizing land use in adjacent areas and in the larger watershed and physical features on or near the beach.

Special Study – Monitoring, research, and data analysis conducted beyond routine Enterococci monitoring at beaches participating in the MHB program. Typically, special studies are conducted in areas with chronic bacterial pollution.

Vegetative Buffer – Undeveloped, vegetated area directly adjacent to a body of water. Vegetative buffers can reduce harmful runoff, stabilize soils, and provide wildlife habitat.

Wastewater treatment plant – A sanitary sewer collection and treatment system owned by a state or a municipality. The system includes infrastructure for the transport, storage, and treatment of municipal sewage or industrial wastes. Also referred to as a publicly owned treatment works (POTW).

Watershed – The land area which drains to a particular waterbody. Watersheds exist at all landscape scales, from local stream watersheds to larger, regional watersheds.