Maine Healthy Beaches Program
Risk Assessment Matrix
Standard Operating Procedure

A. Scope and Application

The Maine Healthy Beaches (MHB) Program uses a risk-based ranking system to assist in evaluating and classifying designated coastal beaches and their management areas. Bacteria levels can change rapidly and the lag-time between sample collection and bacteria results requires additional tools to help make informed beach management decisions.

A Risk Assessment Matrix (RAM) is a preliminary assessment of beach characteristics, activities, and water quality. This assessment helps beach managers gain a better understanding of the actual and potential pollution sources impacting the beach and the typical "worst-case-scenario" leading to unsafe bacteria levels at coastal swim beaches. The RAM ranks each beach or beach management area (BMA) based on a points grading system. This ranking will determine the best management course of action (i.e. monitoring frequency, posting a precautionary advisory following rainfall, the need to implement a more thorough sanitary survey, etc.).

The purpose of the RAM is to:

- Provide a preliminary assessment of potential/actual pollution sources and to determine the need for an in-depth sanitary survey of the shoreline and adjacent watershed area(s).
- Assist beach managers in making well informed beach management decisions related to monitoring, assessment, and public notification of beach water quality conditions.
- Work in conjunction with routine monitoring, special studies and sanitary survey work to build a "profile" of each BMA.

B. Equipment List

- ✓ Pencils/pens
- ✓ Clipboard
- ✓ Risk Assessment Matrix (Appendix A)
- ✓ Definitions (Appendix B)

C. Definition of a Beach Management Area (BMA)

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

An initial RAM of the entire beach will help managers determine if separation of the larger beach area is warranted. Possible 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 stormdrain impacting the shoreline on the north end of the beach increases the likelihood of bacterial pollution compared to the southern end). This also includes large beach areas where the water quality results are not consistent throughout the entire length of beach.
- Timely monitoring and public notification of conditions are not practical for the entire beach (e.g. areas not promoted for public use including privately owned areas, areas not serviced by lifeguards, or deemed unsafe for recreational purposes).
- A section of the beach has a larger density of public use (bather load) compared to other areas.
- The beach has historically informal names or sections known to the public.
- Other safety and access factors including rocks, rip-currents, critical habitat for endangered species, etc.

D. Prepare for the Field

1. Before heading to the field read through the RAM to familiarize yourself with the process and what resources are necessary to successfully complete the exercise.
2. Obtain copies of data and reports specific to the beach management area(s). Items that will assist in completing the RAM include, but are not limited to:
    - Water quality data and sanitary survey reports (MHB Program, Dept. of Marine Resources, Dept. of Environmental Protection, Conservation Commission Reports, Watershed Groups)
    - Local rainfall data
    - Advisory/closure data (MHB Program)
    - Previous completed Risk Assessment Matrix (if applicable)
    - Circulation studies, data analysis, and other special studies

E. Completing the RAM

A RAM should be completed for each Beach Management Area. This document should be frequently updated, typically every 1-3 years. The frequency of updates depends on the rate of development, changing conditions, designated use, etc., and as more information/data becomes available. The coastal surf zone is a dynamic environment where conditions can change very rapidly. Each beach management area has its own set of factors impacting the recreational water quality.

If bacteria problems are consistently documented, simply examining the areas/properties directly on or adjacent to the beach may not be sufficient to thoroughly investigate all of the actual/potential sources of contamination affecting the beach. Typically, further sanitary survey work includes additional monitoring of fresh water inputs, septic system inspections, property surveys, etc. within the upland area draining to the beach (i.e. watershed).

While completing the RAM be sure to:

- ✓ Complete all sections of the RAM as thoroughly as possible.

- ✓ Integrate the expertise and knowledge of local officials (e.g. code enforcement officers, local plumbing inspectors, planners, conservation commission members)
- ✓ Refer to the Definitions in Appendix A for terms used in the RAM.

Complete the Following Sections of the Risk Assessment Matrix:

I. Beach History

- ✓ Access previous years' monitoring, posting, and environmental data to determine each criterion's point value. This information can be found from MHB Program data, sanitary surveys, special studies, and local weather monitoring stations.
- ✓ Total the number of points and enter the sum in the **Section I. Total Points Box.**

II. Potential and Actual Sources of Contamination

- ✓ Access the appropriate data/reports and conduct on-site evaluation to obtain the information for this section.
- ✓ Fill out each segment and record individual totals. Transfer the sums to the associated boxes at the end of this section.
- ✓ Total the number of points from each segment and enter the sum in the **Section II. Total Points Box.**

III. Beach Uses and Conditions

- ✓ Access the appropriate data/reports and conduct on-site evaluation to obtain the information for this section.
- ✓ Total the number of points and enter the sum in the **Section III. Total Points Box.**

IV. Subtract Points for the Following

- ✓ Access the appropriate data/reports and conduct on-site evaluation to obtain the information for this section.
- ✓ Total the number of points and enter the sum in the **Section IV. Total Points Box.**

V. Significance

- ✓ Beach importance to the local economy and to the public may not be easily determined. If economic statistics, beach use information, evaluation of beach users, etc. are not available, do your best at estimating.
- ✓ Total the number of points and enter them in **Section V. Total Points Box.**

VI. RAM Final Score

- ✓ Enter the section totals in their corresponding boxes.
- ✓ Total all of the section points and enter the final score in the **Section VI. Final Total Box.** This final RAM score will correspond with the RAM Ranking system.

F. RAM Ranking System

The final RAM score corresponds to a ranking or grade with associated recommendations. These grades are meant as a ***guideline*** to help communities and resource managers assess the recreational water quality and safety of their beaches. Remember that conditions can change very rapidly in the coastal zone and the RAM is simply one piece of the management "tool-box".

The exercise of completing the RAM will allow beach managers to gain a better understanding of the beach area and to assist them in making well-informed management decisions. The RAM is a tool intended to guide decisions on when it is appropriate to post an advisory or closure for a particular beach management area or when a more thorough sanitary survey is warranted.

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

- Bacteria results are slightly above the safety limit of 104 MPN of Enterococci/100mls of sample water, there is no known safety hazard (e.g. sewage treatment plant overflow), the conditions are not the typical "worst-case-scenario" and the Beach Ranking is an A. The beach manager may choose to wait for the resample results before posting an advisory.
- The same conditions as above, but the Beach Ranking is a D or F. The beach manager may choose a more cautious approach and post an advisory or closure prior to the availability of resample results.

Beach Rankings and Corresponding Scores

A (0 – 20 points): Suggested Action: Conduct routine monitoring once per week or less. Continue to update the RAM and take precautionary actions to maintain healthy conditions. Promote routine septic system inspections, planting buffers to reduce runoff, pump out stations for boats, reduce impervious surfaces, etc.

B (21 – 35 points): Suggested Action: Continue to monitor at least one per week or more depending on the recorded bacteria levels. Conduct additional monitoring of freshwater inputs (river mouth, stream, storm drain) during wet weather events. Depending on the results, consider posting an advisory during and after heavy rainfall. Education and outreach efforts should promote healthy sanitary practices at the beach and within the larger watershed.

C (36 – 50 points): Suggested Action: Continue to monitor at least one per week or more depending on the recorded bacteria levels. Examine the relationship between bacteria levels and other parameters (i.e. rainfall, tidal stage). Consider posting an advisory during and following heavy rainfall. An effort should be made to investigate the actual/potential pollution sources. Additional monitoring within the watershed including storm drains, rivers, and streams may be warranted. Consider offshore activities such as poor boating practices, maintenance of overboard discharge units and sewage treatment outfalls. Identify sources and remediate them. Education and outreach efforts should promote healthy sanitary practices at the beach and within the larger watershed.

D (51 – 70 points): Suggested Action: Monitor at least twice per week or more depending on the recorded bacteria levels. Post an advisory until sample results are consistently below the safety level. Consider posting additional signage communicating that the beach experiences high bacteria levels due to stormwater runoff, malfunctioning septic systems, poor boating practices, etc. All direct and indirect bacterial pathways to the beach should be examined. Special studies, additional data analysis, and sanitary survey work is warranted. Properties within the watershed should be surveyed for malfunctioning septic systems and other land-use practices leading to unhealthy bacteria levels. Investigate activities onshore and offshore. Education and outreach efforts should promote healthy sanitary practices at the beach and within the larger watershed.

F (> 70 points): Suggested Action: Post a permanent advisory or closure at the beach until results are consistent and demonstrate healthy conditions. Implement additional monitoring and special studies within the watershed to pinpoint pollution sources. The local codes enforcement officer/plumbing inspector should survey all properties within the relevant watershed for malfunctioning septic systems. Agricultural and other land-use practice should be examined. Consider collaborating with local, state and federal partners to identify and address pollution sources. Education/outreach efforts and best practices should be practiced throughout the watershed.

Maine Healthy Beaches (Coastal) Program Contact Information:

Keri Lindberg, Program Coordinator
University of Maine Cooperative Extension and Sea Grant
377 Manktown Road
Waldoboro, ME 04572
p. 207-832-0343 or 1-800-244-2104
FAX: 207-832-0377
email: klindberg@umext.maine.edu
www.mainehealthybeaches.org

Mark Margerum, Program Manager
Maine Department of Environmental Protection
Augusta, ME 04333
p. 207-287-7842
FAX: 207-287-7826
email: Mark.T.Margerum@maine.gov

For more information on non-point source pollution and education:

http://www.epa.gov/OWOW/NPS/
http://www.epa.gov/epahome/educational.htm

Appendix A

Maine Healthy Beaches Risk Assessment Matrix

Maine Healthy Beaches Risk Assessment Matrix

Town/State Park: _____

Beach or Beach Management Name: _____

Date of Evaluation: _____

Beach Management Area Boundaries: _____

_____

_____

Evaluator Name(s):_____

Title: _____

Address: _____

Phone: _____ **Fax:** _____ **Email:** _____

I. Beach History

1. The geometric mean for beach monitoring sites (past season):

≥ 35 col/100mls (# sites ___ x 10 points)	
< 35 col/100mls (0 points for each site)	

2. Was an "advisory" or "closure" posted during previous season due to fecal contamination?

Yes (10 pts)	
No (0 pts)	

3. How long was the beach posted during the previous season due to elevated levels of bacteria?

0 days (0 points)	
1-5 days (5 points)	
6-10 days (8 points)	
11-15 days (15 points)	
>16 days (20 points)	

4. Was an "advisory" or "closure" posted during the bathing season 2 years ago?

Yes (5 points)	
No (0 points)	

5. Was an "advisory" or "closure" posted during the bathing season 3 years ago?

Yes (5 points)	
No (0 points)	

6. Any confirmed recreational water illnesses directly related to beach water quality reported in the past 4 years?

≤ 2 reports/year (10 points)	
≥ 3 reports/year (20 points)	
0 reports (0 points)	

7. Has wet weather or storm sampling resulted in enterococci scores greater than 104?

Yes (10 points)	
No (0 points)	

7a. If yes, what was the number of significant (>3") rainfall events in the past beach season?

0 events (0 points)	
1 event (2 points)	
2 or more events (4 points)	

Section I. Total Points: _____ points

II. Potential and Actual Sources of Contamination

Impact Guidelines

1. adjacent (and/or upstream) to the beach property
2. adjacent to a stream that empties onto the beach area within 1/4 mile of the beach boundary
3. impacts the beach due to proximity or location

1. Score 1 point for each of the following that impacts the beach based on impact guidelines:

i. Land Drain	
ii. Animal Farm or Kennel	
iii. Roof Gutter Drain	
iv. In-ground septic system	
Segment 1 Total	_____points

2. Score 5 points for each of the following that impacts the beach based on impact guidelines:

i. Waterbody on the 303d list with bacteria as a pollutant (# waterbodies__ x 5 points)	
ii. Waterbody with a TMDL study for bacteria (# waterbodies__ x 5 points)	
Segment 2 Total	_____points

3. Score 15 points for each of the following that impacts the beach based on impact guidelines:

i. Stream flows, not related to rain event (may flow intermittently)	
ii. Stream flows, rain related	
iii. Malfunctioning septic system	
iv. Septic systems that have not been inspected in over 3 years	
v. Overboard Discharge Unit (OBD)	
vi. Marina	
vii. Mooring Field	
viii. Outhouse	
ix. Stormwater Pipe	
Segment 3 Total	_____points

4. Score 25 points for each of the following that impacts the beach based on the impact guidelines:

i. Graywater (sink/laundry, basement drain)	
ii. Combined Sewer Overflow (CSO)	
Segment 4 Total	_____points

Section II Segment Totals

Segment 1 Total	
Segment 2 Total	
Segment 3 Total	
Segment 4 Total	
Section II. Total Points:	_____points

III. Beach Uses and Conditions

1. The number of people visiting the beach throughout the season:

< 50,000 visitors (1 point)	
50,000 - 150,000 visitors (5 points)	
> 150,000 visitors (10 points)	

2. The number of people that visit any one mile stretch of beach during the time of maximum use:

< 50,000 visitors (1 point)	
50,000 - 150,000 visitors (5 points)	
> 150,000 visitors (10 points)	

3. Are there public restrooms located with 400' (feet) of the beach?

Yes (0 points)	
No (15 points)	

3a. If yes, what type of public restrooms are they?

Sewered (0 points)	
Septic (5 points)	
Port-a-potty (10 points)	
Outhouse (15 points)	

4. Are domestic animals allowed on the beach during the months of May - September?

Yes (5 points)	
No (0 points)	

5. Are there large numbers of wildlife regularly present on/near the beach? (ex. flocks of birds)

Yes (2 points)	
No (0 points)	

6. Are there significant wildlife areas near or adjacent to the beach watershed?

Yes (5 points) _____ ☐
No (0 points) _____ ☐

7. Impervious surface scoring (based on location/proximity to the beach):

Each parking lot located within 100 feet
(# lots ___ x 5 points) _____ ☐

Each building roof located within 200 feet
(# roofs ___ x 1 point) _____ ☐

Each road the length of the beach within 500 ft
(# roads ___ x 5 points) _____ ☐

8. Proximity of a Waste Water Treatment discharge pipe to the beach:

< 5 miles (5 points) _____ ☐
≥ 5 miles (0 points) _____ ☐

Section III. Total Points: _____ ☐ points

IV. Subtract Points for the Following:

i. Each active marine vessel pump-out station within 3 miles of the beach
(# stations___ x 5 points) _____ ☐

ii. Each property located within 200 feet of the beach that is tied to a municipal sewer system
(# properties___ x 10 points) _____ ☐

iii. Each property located within 200 feet of the beach that are tied to a maintained stormwater system
(# properties___ x 10 points) _____ ☐

iv. Assess 10 points if the beach has a 200 foot deep buffer area of plants along the entire length of the beach (except for narrow access points) _____ ☐

v. Assess 5 points if beach management has posted educational signs about pollution resulting from soiled diapers, dog feces, gull feeding, and/or advertising public restroom locations _____ ☐

vi. Assess 10 points if a sanitary shoreline survey or watershed survey has been conducted .....

vii. Assess 5 points if beach models are being used for beach management .....

viii. Assess 3 points if trash cans are located at the beach .....

ix. Assess 3 points if doggie waste bags and receptacles are provided at entry points: .....

Section IV. Total Points: _____points

V. Significance

i. Beach importance to local economy

High (4 points) .....

Low (2 points) .....

ii. Beach importance to the public

High (4 points) .....

Low (2 points) .....

Section V. Total Points: _____points

VI. RAM Final Score

Section	Total Points
I. Beach History	(+)
II. Sources of Contamination	(+)
III. Beach Uses and Conditions	(+)
Subtotal Sections I-III	
IV. Subtract Points	(-)
Subtotal (I-III) minus IV	
V. Significance	(+)
Final Score	

FINAL COMMENTS AND PLANNED ACTIONS:

Appendix B

Definitions

Definitions

Advisory - Not a closure, but a notice informing the public of the potential risk associated with current coastal recreational water conditions in Maine, a town must have a specific ordinance in order to close a beach.

Analysis - an examination to determine parts or elements of a substance (i.e. analysis of bacteria for beach water quality). A statement showing the results of such an examination.

Bacteria - unicellular organisms lacking a nucleus and chlorophyll; used in MHB Program to indicate the potential for pathogens to be present in the water

Beach - land that is intended for recreational bathing, swimming, surfing or any other direct water contact; beaches are managed by municipalities, the Maine Department of Conservation (State Park beaches), or privately owned

Beach Management Area - a segment of, or an entire beach that is managed independently from other segments, or beaches due to potential pollution impacts or capacity of management to provide notification of

Closure - Official closing of a beach to the public by a local authority to ensure public safety in the event the coastal recreational site is deemed unsafe for recreational water contact. Closures may not be legal unless the town has an ordinance granting the local authority this power.

Combined Sewer Overflows (CSO) - Consist of mixtures of domestic sewage, industrial and commercial waste waters, and storm water runoff. Overflow may occur when the flow capacity of combined storm drains and sewer systems are exceeded during rainstorms.

Contamination - General term referring to the introduction of undesirable materials (chemical, microorganisms, wastes, etc.)

Correlation - Mutual relation; systematically connected

Criteria - measurable physical, chemical, or biological characteristics commonly used as a basis for setting standards.

Enterococci - the established bacterial indicator for designated coastal recreational waters in Maine. Indicates fecal contamination and the possible presence of pathogens.

Fecal contamination - introduction of fecal matter by contact or association into the environment

Geometric mean - Reduces the influence of outlying (i.e. the very low and very high) numbers on the data set. The data is transformed to the logarithmic values of each data point and then averaged (summed and divided by the number of terms).

Impervious surface - incapable of being penetrated by moisture. Impervious surfaces are mainly constructed surfaces - rooftops, sidewalks, roads, and parking lots - covered by impenetrable materials such as asphalt, concrete, brick, and stone. These materials seal surfaces, repel water, and prevent precipitation and meltwater from infiltrating soils. These surfaces cause rapid run-off of storm water and contribute to non-point source pollution.

Inactive straight pipe - not in use. Signs of non-use might include: the pipe is visibly disconnected from the ground and is lying on the shore; large amounts of corrosion and rotten spots; no flow or moistness in pipe; no noticeable variation in vegetation directly under the pipe versus vegetation t o either side of the pipe; no pieces of tissue in various stage of decomposition. If you are uncertain whether a pipe is active or inactive, please note this on field sheet and give explanation as to why you think it is active or inactive so that this may be followed up.

Intermittent streams - streams that may only flow at certain times of the year (usually related to spring run-off) or after large rainfall events. Generally, intermittent streams will be narrow and shallow, with varying flow rates.

Licensed overboard discharge (OBD) - a septic waste disposal system that treats wastes in a series of chambers and ultimately treats wastes with chlorine before discharging the treated wastewater into coastal waters just beyond the extent of low-tide. Since these are point discharges, they are required to be licensed by the state, and are currently being phased out by the Department of Environmental Protection (DEP).

Malfunctioning septic systems - are of primary concern due to public health issues. You can usually tell a failing system by: odor; presence of swamp species such as cattails in an otherwise normal vegetation area; seepage from the tank or leech field area; mushy areas above the system; indents in the ground or other signs that the cover or tank might have collapsed

Nonpoint source pollution - indirect contamination (i.e. urban/agricultural runoff); many diffuse sources as compared to point source (i.e. straight pipe)

Notification - to give notice of or report the occurrence of an event

"OPEN" - This beach is open for swimming and water contact activities; the water meets state standards for acceptable conditions

Ordinance - a municipal regulation; an authoritative law or decree

Point source pollution - direct contamination (i.e. effluent pipe/smoke stack) as compared to non-point source (i.e. storm runoff)

Pollution - the presence of harmful contaminants in the environment

Posting - placement of a sign(s) at beach access points; making information available to the public through website, hotline, or other means

Protocol - a detailed written procedure for field and or laboratory operation (e.g. sampling, analysis) that must be strictly followed for quality assurance and quality control

Recommendation(s) - advice or counsel

Risk Assessment Matrix - is a tool designed to help communities assess potential human health risks associated with water pollution at coastal swim beaches. The beach area is assigned a grade and there are associated recommendations that accompany that grade. These grades are meant as a guideline to help communities assess the safety of their beaches for recreational water users.

Risk - exposure to possible danger, loss, or injury

Sanitary Shoreline Survey - survey performed to identify actual or potential sources of contamination that may affect water quality. A tool used in assessing beach water quality for public health.

Sewage - Potential source of microbiological contamination of recreational waters. May be associated with system failures in human sewage treatment facilities, leaking sewer lines, septic systems, or with rainfall and resulting surface water runoff.

Standard Operating Procedure (SOP) - Officially approved document describing prescribed techniques. Accepted method of performance.

Steady streams - are streams, creeks or other flowages that have a constant motion and are not impeded. Steady streams tend to be both wider and deeper.

Tier(ed) - layered; rows arranged one above another

Quality assurance (QA) - An integrated management system designed to ensure hat a product and/or service meet defined standards of quality with a stated level of confidence.

QAPP - Quality Assurance Project Plan. A formal document describing the necessary quality assurance procedures and quality control activities that must be implemented to ensure that the work performed will satisfy the stated performance or acceptance criteria

Quality Control - The overall system of technical activities whose purpose is to measure and control the quality of a product or service

Advisory - This beach is unsafe for swimming or water contact activities. This beach does not meet state standards for acceptable bacteria levels.

Water quality criteria - specific levels of pollutants, which, if reached or exceeded, are expected to render a body of water unsuitable for its designated use.

Water quality guidelines - Specific levels of water quality criteria which, if reached or exceeded, may adversely affect human health or aquatic life. They are unenforceable guidelines issued by a governmental institution or other agency.

Water quality standards - state-adopted and EPA approved standards for water quality measures.