2020 RHODE ISLAND BEACH AND RECREATIONAL WATER QUALITY REPORT

RHODE ISLAND DEPARTMENT OF HEALTH

BEACHES ENVIRONMENTAL ASSESSMENT
AND COASTAL HEALTH PROGRAM

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May 19, 2021

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Executive Summary

The Rhode Island Department of Health (RIDOH) is responsible for the licensing and regulation of bathing beach facilities in the State of Rhode Island, including both fresh and saltwater beaches. Funding for the RIDOH Beach Program for salt waters is provided by the United States Environmental Protection Agency (USEPA) through the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000, an amendment to the Federal Water Pollution Control Act (also known as the Clean Water Act) of 1972. These funds support primary programmatic activities including sanitary surveys, development and implementation of a risk-based monitoring plan, bacteriological testing at saltwater beaches, and a public notification system.

During the 2020 Beach Season (from May 25th through September 7th), RIDOH sampled and analyzed 1649 samples collected from 63 licensed saltwater beaches (Appendix A) and from two urban beaches which are under consideration to become licensed beaches. RIDOH partner, Save the Bay, collected an additional 62 samples from three other unlicensed urban beaches for analysis by the RIDOH Beach Program. Samples were analyzed for *Enterococcus* bacteria using the IDEXX *Enterolert* Method at the RIDOH State Laboratory (Budnick et al., 1996).

In the 2020 bathing season, saltwater beach closure days were in the range of those observed over the past ten years. For the 64 monitored saltwater beaches, there were 33 closure days over 19 closure events. The closures in 2020 occurred at 12 beaches, down from 21 beaches in 2019 and up from the all-time low of eight beaches in 2016. The total rainfall was much lower in 2020 at 6.58 inches compared to the 2019, 2018 and 2017 seasonal totals of 11.4, 9.1, and 8.8 inches, respectively. Inter-annual variability in beach closures associated with poor water quality may still be correlated with precipitation to some degree, but apparently much less than during the early years of the millennium. This pattern will not be fully tested until there are additional high rainfall seasons (i.e., at least 15 cumulative inches during the season).

Although only three Upper Narragansett Bay beaches had closures due to poor water quality during the 2020 season, two additional Upper Bay beaches were not open due to COVID19 but also experienced high microbial counts. If these additional beaches were taken into account, the Upper Bay beaches would have accounted for 52% of the total closure events. This was a notable difference from 2019 when two (Bristol and Conimicut) of the six licensed Upper Narragansett Bay beaches represented only 2% of the total closure days. In the 2018 beach closure data, 54% of the total closure days were attributed to Upper Bay beaches. Again, data from additional years with varying environmental conditions are needed to determine if there is an apparent trend.

RIDOH research continues to investigate methods that could allow advisories to close beaches closer to the time when risks of pathogen exposure are the greatest. Studies to establish the status of water quality at several “Urban Beaches” in upper Narragansett Bay are also ongoing.

1.0 PROGRAM STANDARDS

1.1 Mission

The mission of RIDOH is to prevent disease and to protect and promote the health and safety of the people of Rhode Island. Within RIDOH, the Beach Program works to protect the public from illness associated with swimming in contaminated bathing waters. The primary means to provide protection is through routine monitoring and reporting when pathogens that constitute risks are present during the bathing season. The Beach Program also assists beach owners and managers by advising on approaches to find and eliminating sources of contamination.

1.2 History

RIDOH began monitoring beaches in the summer of 1995. Prior to 1995, the Rhode Island Department of Environmental Management (RIDEM) was responsible for monitoring recreational waters.

In 1999, RIDOH initiated a comprehensive beach-monitoring program titled Bacterial Water Quality Monitoring at Upper Narragansett Bay Bathing Beaches with USEPA funding from an Environmental Monitoring for Public Access and Community Tracking (EMPACT) grant. This grant enabled RIDOH to establish a public notification system including a website, telephone hotline, and beach signage system. RIDOH evaluated conditions in Upper Narragansett Bay, which has long been impacted by urban runoff, point source discharges, and combined sewer overflows (CSOs).

The EMPACT Program provided RIDOH with the resources to sample 23 stations in the Upper Narragansett Bay during wet and dry weather. The study concluded that additional sampling was necessary at the licensed Upper Bay beaches to adequately protect the public. In addition, due to identified contamination sources and analytical results, the areas north of Conimicut Point in Warwick and Nayatt Point in Barrington were deemed unsuitable to serve as licensed facilities.

In 2000, Congress enacted the Beaches Environmental Assessment and Coastal Health (BEACH) Act, an amendment to the Federal Water Pollution Control Act. The BEACH Act authorizes USEPA to distribute grants to eligible states, territories, and tribes to reduce the risk of disease and illness in the nation's bathing waters. State objectives under this program were published by USEPA in June 2002. The National Beach Guidance and Required Performance Criteria for Grants document promulgated by USEPA further stipulates several requirements of the BEACH Act, including: a tiered categorization of beaches according to risk, identification and mitigation of pollution sources, a risk communication plan, and specific beach monitoring information.

Since 2000, USEPA has provided RIDOH with over $3.2 million in beach grants to manage Rhode Island's Beach Program. These grants have provided RIDOH with the resources to maintain critical continuity in monitoring Rhode Island's licensed bathing beaches for the purpose of characterizing risks, and how they change over time. Without this data, it would not be possible to understand which of our States valuable beach resources need the most attention to identify and reduce sources (point and non-point) of contamination. Likewise, the monitoring data are critical in assessments that tell us how well management strategies are working to improve coastal water quality in Rhode Island.

Currently, RIDOH does not conduct surface water monitoring at freshwater bathing beaches. To ensure public safety, freshwater beach managers are responsible for sampling and following RIDOH approved regulations and monitoring recommendations.

1.3 Enacted Legislation

In accordance with the Rhode Island Regulation 216-RICR-50-10-3 (1/17/2018), and prior Regulation (R23-21-RF(A)(1.4 as amended January 2002) within the General Laws of Rhode Island, a "bathing beach" is defined as a natural area or tract of land that is used in connection with swimming and/or bathing in any waters of the state provided:

a) It is open to the public by permit and/or payment of a fee; or

b) It is maintained as a private club or association requiring membership fees or dues; or

c) It is maintained with or without charge for the recreation of groups of ten (10) or more children.

Please Note: Due to the important monitoring and protections provided by licensed beaches, RIDOH recommends only swimming at licensed bathing beach facilities.

Also per Rhode Island Regulation 216-RICR-50-10-3 (1/17/2018), and prior Regulation (R23-21-RF(A)(1.4 as amended January 2002), licensing of recreational facilities requires facilities to have electrical service; refuse storage and disposal; sewage disposal facilities; adequate toilets, showers, or lavatories with hot and cold running water; a drinkable water supply; and the water adjacent to a bathing beach must meet bacteriological standards. Specific requirements are dependent on the number of users. Reference to these requirements can be found within the Rules and Regulations for Licensing of Recreation Facilities within the General Laws of Rhode Island.

Per R23-22.5 Drowning Prevention and Lifesaving

Beach Rules and Regulations Promulgated in Accordance with Chapter 3343 of the Public Health Laws of 1954

1. All individuals employed as lifeguards after June 30, 1954 at bathing areas within the State of Rhode Island shall hold an active state lifeguard certification card as issued by the Division of

Parks and Recreation, within RIDEM. Lifeguards holding surf cards may be employed at either surf or non-surf bathing areas. Lifeguards holding non-surf cards shall be employed only at non-surf bathing areas. All certification cards are active during the season of their employment and until the following June 30 unless suspended or revoked by the Division of Parks and Recreation.

2. All bathing areas shall provide lifeguard equipment and personnel according to the requirements of the Division of Parks and Recreation and shall provide such equipment and personnel whenever the facilities of the area are open for business.

3. All lifesaving equipment shall be maintained in good operating condition ready for immediate use.

4. All bathing areas shall post conspicuously the hours of duty of lifeguard personnel.

5. A telephone for emergency calls shall be readily accessible from every bathing area. Numbers of police, fire, and rescue units of the area shall be posted conspicuously beside the telephone.

6. No power boats shall be allowed within any bathing and swimming area. The management of each bathing area shall maintain his area free from driftwood and other objects which may cause injury.

7. No bathing area shall operate on any given day unless a state certified lifeguard is present during all hours which the facilities are being used.

8. During periods of severe surf, undertow and other emergency conditions the Recreational Safety Inspectors of the Division of Parks and Recreation shall have the authority to close any and all bathing areas whenever such action is deemed necessary in the interest of public safety. Whenever a bathing area has been closed because of the aforesaid conditions, lifeguards shall be retained on the beach to caution prospective bathers against entering the water.

9. The bathing season shall, for each year, last from May 30th until 6:00 PM of each Labor Day unless the Division of Parks and Recreation gives notice to the contrary.

1.4 Standards

Recreational water quality standards for Rhode Island saltwater bathing waters are under review. The State currently applies a single sample benchmark, EPA's recommended Beach Action Value (BAV) of 60 *Enterococcus* (measured in most probable number [MPN]) per 100 milliliters (ml) of water as a trigger to consider issuing a "no swimming" advisory. The Rhode Island Department of Environmental Management (DEM) regulations include an additional standard, a geometric mean of 33 *Enterococcus* (MPN). In practice, the DEM standard is applied across broad areas rather than the smaller areas that represent recreational waters adjacent to beaches.

The analytical method for monitoring for conformance with the BAV utilizes the IDEXX *Enterolert*© 1600, a USEPA-approved method to enumerate *Enterococcus*. *Enterolert*© provides a range of *Enterococcus* counts from less than 10 to greater than 24,192 MPN/100ml. The principal limitation of IDEXX *Enterolert*© is that it takes more than 24 hours from sample reception at the laboratory to reporting of analytical result. In other words, there is over a full day delay from when the sample is collected to when the results are received. Decisions to close and/or re-open a beach are generally made in the late afternoon on the day after sample collection. This translates to risk for beach-goers who may be exposed to contaminated water that will not be identified until the next day, with a management response a full two days after the sample was collected. In some cases, the delay may result in beach closures after the beach(es) may have become safe for swimming.

RIDOH is continuously reviewing promising new methods that would better meet the intent of standards to protect public health without unnecessary restrictions of use. These methods include new analytical methods and predictive modeling (see Section 4).

2.0 NATIONAL BEACH GUIDANCE AND REQUIRED PERFORMANCE CRITERIA FOR GRANTS, 2014 ED.

USEPA has developed 11 performance criteria for the implementation of monitoring, assessment and notification programs. To be eligible for a grant to implement a monitoring and notification program the state, tribal, or local government's program must be consistent with these performance criteria. These performance criteria are based on and incorporate other requirements of the BEACH Act as well. The 11 performance criteria listed below are quoted directly from the National Beach Guidance and Required Performance Criteria for Grants, 2014 Ed (US EPA 2014).

Performance Criterion 1: Risk-based Beach Evaluation and Classification Process

Performance criterion 1 requires a state or tribe to develop a risk-based beach evaluation and classification process and apply the process to its coastal recreation waters. The process must describe the factors used in the state's or tribe's evaluation and classification process and explain how the state's or tribe's coastal recreation waters are ranked as a result of the process. That process must result in a list of specific coastal recreation waters adjacent to beaches or similar points of access used by the public.

Performance Criterion 2: Tiered Monitoring Plan

Performance criterion 2 requires a state or tribe to develop a tiered monitoring plan. The plan must adequately address the frequency and location of monitoring and the assessment of coastal recreation waters on the basis of the periods of recreational use of the waters, the nature and extent of use during certain periods, the proximity of the waters to known point and nonpoint sources of pollution, and any effect of storm events on the waters. EPA has added three new considerations to the basis for developing the tiered monitoring plan.

Performance Criterion 3: Methods and Assessment Procedures

Performance criterion 3 requires a state or tribe to develop detailed assessment methods and procedures. States and tribes must adequately address and submit to EPA methods for detecting levels of pathogens and pathogen indicators that are harmful to human health in coastal recreation areas. States and tribes must also provide documentation to support the validity of methods other than those that EPA validated or approved. Finally, states and tribes must identify and submit to EPA assessment procedures for identifying short-term increases in pathogens and pathogen indicators that are harmful to human health in coastal recreation areas.

Performance Criterion 4: Monitoring Report Submission

Performance criterion 4 requires states and tribes to develop a mechanism to collect and report monitoring data in timely reports. States and tribes must report their monitoring data to the public in a timely manner, including posting on a website. They must report their monitoring data to EPA at least annually or at a frequency required by the EPA Administrator. EPA encourages states to coordinate closely with local governments to ensure that monitoring information is submitted consistently. Reported data must be consistent with the list of required data elements.

Performance Criterion 5: Delegation of Monitoring Responsibilities

Performance criterion 5 requires a state to document any delegation of monitoring responsibilities that might have been made to local governments. If monitoring responsibilities are delegated to local governments, the state grant recipient must describe the process by which the state may delegate to local governments responsibility for implementing the monitoring program.

Performance Criterion 6: Public Notification and Risk Communication Plan

Performance criterion 6 requires that a state or tribe develop a public notification and risk communication plan. The plan must describe the state's or tribe's public notification efforts and measures to inform the public of the potential risks associated with water contact activities in the coastal recreation waters that do not meet applicable Water Quality Standards (WQS).

The state or tribe must adequately identify measures to promptly communicate the occurrence, nature, location, pollutants involved, and extent of any exceedance or likelihood of exceedance of applicable WQS for pathogens and pathogen indicators. The state or tribe must identify how it will promptly communicate that information to EPA. States are responsible for identifying how they will promptly communicate the failure to meet applicable standards to a designated official of the local government in the area adjoining the coastal recreation waters with water quality problems.

A state or tribal government program must describe procedures for posting signs at beaches or similar points of access, or for taking functionally equivalent communication measures that are sufficient to give notice to the public that the coastal recreation waters are not meeting or are not expected to meet applicable WQS for pathogens and pathogen indicators.

Performance Criterion 7: Actions to Notify the Public

Performance criterion 7 requires that a state or tribe give notice to the public when coastal recreation waters are not meeting or are not expected to meet applicable WQS for pathogens and pathogen indicators.

A state or tribe must post signs at beaches or similar points of access or must provide functionally equivalent communication measures that are sufficient to give notice to the public that the coastal recreation waters are not meeting or are not expected to meet applicable WQS for pathogens and pathogen indicators.

Performance Criterion 8: Notification Report Submission

Performance criterion 8 requires that states and tribes compile their notification data into timely reports. States and tribes must report to EPA the actions they have taken to notify the public when WQS are exceeded.

Performance Criterion 9: Delegation of Notification Responsibilities

Performance criterion 9 requires that states describe any notification responsibility they have delegated or intend to delegate to local governments. The state must describe the process by which the state may delegate to local governments responsibility for implementing the notification program.

Performance Criterion 10: Adoption of New or Revised WQS and Identification and Use of a Beach Notification Threshold

Performance criterion 10 is a new criterion, intended to focus on adoption of new or revised WQS as required by CWA section 303(i)(1)(B) and identification and use of an appropriate beach notification threshold. These requirements apply to states and tribes receiving grants under CWA section 406(b), and they will be implemented through conditions included in the grants.

Performance Criterion 11: Public Evaluation of Program

Performance criterion 11 requires that states and tribes provide the public with an opportunity to review the program through public notice and provide an opportunity to comment. This is not a one-time requirement; public input must be sought whenever a state or tribe makes significant changes to its beach program. If a state or tribe significantly changes its List of Beaches, beach ranking, or other elements of its monitoring and notification program, the public must have an opportunity to review the changes before implementation. Further, states and tribes should consult with the applicable EPA Region prior to making significant program changes.

The public evaluation can be accomplished through notice and public comment, meetings, forums, or workshops. For example, when classifying and ranking beaches, it is beneficial to gather input from members of the community regarding the recreational waters they would like monitored. Annual public or community meetings, surveys of the users at the beach, local newspaper articles, or other sources can provide insight into public opinion about the beach, including why the beach is or is not used (e.g., for sunning, running, swimming, or surfing); perceptions of water quality and health problems; and whether beach users desire a monitoring and notification program (if none exists) or how satisfied they are with the current program.

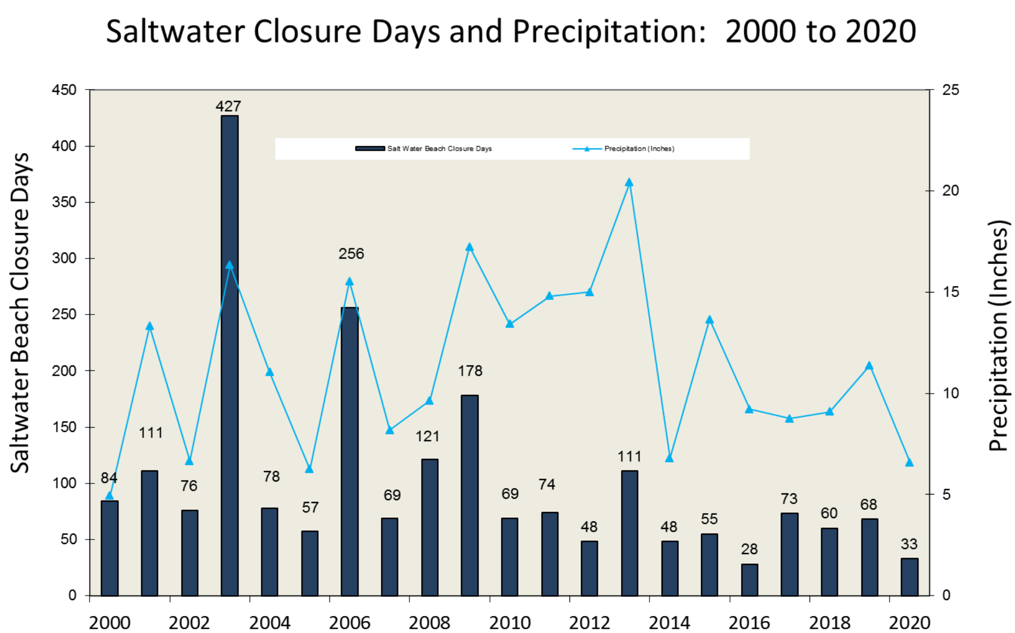
3.0 DATA SUMMARY

In 2020, the total of 19 closure events over 33 closure days was far fewer than the 36 events and 68 days in 2019. The closures in 2020 occurred at 12 beaches, down from 21 beaches in 2019 and up from the all-time low of eight beaches in 2016. The total rainfall was much lower in 2020 at 6.58 inches compared to 2019, 2018 and 2017 seasonal totals of 11.4, 9.1, and 8.8 inches, respectively. The reduction in the number of closure events in 2020 was affected by three Warwick beaches remaining closed for the season due to the COVID19 pandemic. Continued monitoring yielded some high microbial counts. If these Upper Bay beaches were open, there would have been a greater number of closure events.

Closure events are defined as each occasion when a closure recommendation occurs (on a per-beach basis). Closure days are the accumulation of all days when beaches were closed over one or more closure events. The number of closure days has been the standard tracking measure to capture variability in water quality related closures. However, unlike the number of closure events which has a direct association with water quality, the count of closure days is dependent on logistics and management at each beach, including the time needed to conduct follow up sampling required to affirm that it is safe to lift a closure advisory. The number of closure days may be the best representation of impact to beachgoers, while the number of events is a better expression of water quality conditions from year to year.

Since heavy rain events may affect water quality, tracking these events provides a basis to evaluate their influence. In 2020 there were only four rain events (greater than one-half inch in a 24-hour period) while in 2019 there were eight, vs six in 2018 and seven in both 2017 and 2016. In 2019, thirteen of the 36 closures occurred over a two-day period (July 24-25) following heavy rain. Only three other closures were associated with rain events, as defined above. More than half of all closures occurred on relatively dry days. While closures associated with the heavy rain event in 2019 were notable, in 2016 a similar rain event in July did not result in closures. The 2016 event was on a weekend and two days passed before any samples were collected. This comparison conforms to our understanding that sampling schedules do not capture all conditions that may result in poor water quality, but likewise, that rain events alone may not be adequate predictors of poor water quality.

Figure 1. Rhode Island Saltwater Beach Closure Days and Precipitation 2000-2020



In looking at the broad closure record (Figure 1), dry years can be represented by 2020, 2014 and 2005 with total rainfall at 6.6, 6.8 and 6.2 inches of rain, including four, six and three significant rain events, respectively. In 2020, 2014 and 2005 closure days were 33, 48 and 57, within the range of the 2015-2020 (28-73) record. In recent years, when total rain was moderately higher (i.e., 2019; 11.4 inches and 2015; 13.7 inches), closure days of 69 and 58 were only slightly less than the 78 closure days in 2004, when total rain was 11.0 inches. Still, we have not seen closure days as high as those in 2003 (427), 2006 (256) or 2009 (178) when total rain ranged from 15.5 to 17.2 inches. There is an apparent downward trend, but additional wet years will be needed to determine whether high rain continues to drive the number of closure days up, and to what extent. The average closure days for the past five years (53), matched with an average of 9 inches rain, is less than a third of the 2009 closure days.

If the downward trend in closure events prevails during the next heavy rain years, it would be strong supportive evidence that beneficial changes correlate with a major sewage treatment plant management initiative. Stormwater infrastructure was built to prevent high volumes of combined sewer overflow from the state's largest treatment sewage treatment plant from reaching Narragansett Bay. Upgrades to the facility located on Narragansett Bay at Fields Point in Providence were phased. The first stage was completed in 2008 and the last stage was completed in 2013. The number of beach closure days per inch of rain decreased from a mean of 13.3 for the period from 2003 (first year when *Enterolert* was used) through 2008 down to 5.8 for the period from 2009 through 2019 (2020 excepted due to Covid19 closures). This difference is statistically significant (two tailed t test, $p=0.05$), while the average rainfall over those periods were not significantly different (11.2 vs 12.8 inches, respectively). Still, there is considerable uncertainty in this analysis with respect to trends, particularly because it includes all licensed saltwater beaches in the state, including many outside of Narragansett Bay. Additional information about regional patterns in beach closures over time can be found in Chapter 23 of the State of Narragansett Bay and Its Watershed 2017 Technical Report prepared by the Narragansett Bay Estuary Program.

Table 1. Percentage of 2020 Saltwater Beach Closure Days by City/Town

Percent of Closures	City/Town	Closure Days	Beaches
42%	Newport	14	Easton's Beach, Gooseberry Beach, Hazards Beach, Spouting Rock (Bailey's) Beach
23%	Middletown	7	Peabody's Beach, Third Beach
10%	Barrington (UNB)	3	Barrington Town Beach
6%	Narragansett	3	Scarborough Beach
6%	Tiverton	2	Fogland Beach
6%	Warren (UNB)	2	Warren Town Beach
6%	Warwick (UNB)*	2	Goddard State Park Beach
3%	North Kingstown (MNB)	1	North Kingstown Town Beach

UNB= Upper Narragansett Bay; MNB = Mid-Narragansett Bay; * Conimicut, Oakland and City Park Beach in Warwick were closed due to Covid19 (unable to meet Executive Orders for additional restroom cleaning and social distancing).

Table 1 shows the distribution of 2020 beach closure days across eight Rhode Island towns. Collectively, 65% of all closures occurred at six beaches in Newport and Middletown. The second highest percentage group involved Barrington Town Beach (10%) due to two separate closure events of 3 total days. In the mid-Narragansett Bay area, North Kingstown Town Beach represented only 3% of the total closures in 2020.

It is also of note that five of the eleven beaches had two or more closure events during 2020. Easton's Beach in Middletown had four closure events. Barrington Town Beach in Barrington, Peabody's and Third Beach in Middletown, and Gooseberry Beach in Newport each had two closures. Each 2020 closure event is detailed in Table 2.

Table 2: 2020 Saltwater Beach Closure Summary by City/Town

Closure Date	Re-Opened Date	Beach Name	City/Town	Closure Days
6/11/20	6/13/20	Easton's Beach	Newport	2
6/11/20	6/13/20	Goddard State Park Beach	Warwick	2
6/23/20	6/25/20	Easton's Beach	Newport	2
6/24/20	6/26/20	Gooseberry Beach	Newport	2
6/24/20	6/26/20	Hazards Beach	Newport	2
6/26/20	6/27/20	North Kingstown	North Kingstown	1
7/16/20	7/17/20	Easton's Beach	Newport	1
7/16/20	7/18/20	Third Beach	Middletown	2
7/21/20	7/23/20	Scarborough Beach-South	Narragansett	2
7/21/20	7/22/20	Barrington Town Beach	Barrington	1
8/6/20	8/7/20	Third Beach	Middletown	1
8/6/20	8/7/20	Easton's Beach	Newport	1
8/6/20	8/8/20	Peabody's Beach	Middletown	2
8/13/20	8/15/20	Spouting Rock (Bailey's) Beach	Newport	2
8/18/20	8/20/20	Peabody's Beach	Middletown	2
8/19/20	8/21/20	Gooseberry Beach	Newport	2
8/19/20	8/21/20	Barrington Town Beach	Barrington	2
8/19/20	8/21/20	Fogland Beach	Tiverton	2
8/25/20	8/27/20	Warren Town Beach	Warren	2

Analyses to determine exceedances of EPA 2012 Recreational Criteria were conducted on data from 2016 through 2020. This analysis, reported for the first time in the previous 2019 annual report, includes only Tier 1 beaches, for which the frequency of data collection (two times per week) was sufficient to meet EPA's recommendation for synthesis on a monthly basis. RIDOH's assessment relative to the Criteria was determined based on exceedance for more than one of the past three years.

Table 3a and 3b. Exceedances of EPA's Monthly Geometric Means Criteria at Tier 1 Beaches

3a: Tier 1 Beaches (Upper Narragansett Bay) - Number of Monthly Geometric Means > 30 cfu/100 ml						
Beaches	2016	2017	2018	2019	2020	Criteria Exceeded?
Oakland Beach	1	2	0	0	1	NO
Conimicut Beach	1	1	1	0	2	YES
Goddard State Park	0	1	2	0	0	NO
City Park Beach	0	0	0	0	0	NO
Barrington Town Beach	0	0	0	0	0	NO
Warren Town Beach	0	0	0	0	0	NO
Bristol Town Beach	0	0	0	0	0	NO
Sabin Point Beach	1	2	3	1	0	YES
Rose Larisa Beach	1	2	1	1	0	YES
3b: Other Tier 1 Beaches - Number of Monthly Geometric Means > 30 cfu/100 ml						
Beaches	2016	2017	2018	2019	2020	Criteria Exceeded?
Third Beach	1	0	0	2	1	YES
Peabody's Beach	0	0	0	0	0	NO
Easton's Beach	1	2	2	2	2	YES
Scarborough North	0	0	0	1	0	NO
Scarborough South	1	0	0	2	1	YES
Sandy Point Beach	0	1	1	1	0	YES

* US EPA's Criteria for monthly mean Fecal Indicator Bacteria is 30 Enterococcus cfu/100 ml. RIDOH applies the criteria on a three-year running average; criteria are exceeded when two of the latest three years include at least one monthly exceedance.

Table 3a and 3b summarize results from the analysis, where Table 3a focuses on the Upper Narragansett Bay beaches of the Tier 1 category, and Table 3b presents the rest. In the analysis, every month with a geometric mean greater than 30 colony-forming units (cfu)/100 ml is counted as a single exceedance. Given the three months with sufficient data for analysis, (June - August), the highest potential count for a given year is three. During the three-year period of 2018 - 2020, five of the Tier 1 beaches exceeded the criteria. One was an Upper Bay beach (Conimicut Point) and four (Third Beach, Easton's Beach, Scarborough State Beach- South and Sandy Point Beach) located South of Narragansett Bay. It is interesting to note that Goddard State Park did not exceed the Geometric Mean Criteria during 2020. In prior years, the three first entries (all in the town of Warwick), exceeded the criteria for at least one month, and sometimes for two months. Table 4 below presents the geometric means, calculated per beach season month and sorted by each Tier 1 Beach station.

Table 4. Monthly Geometric Means of Tier 1 Beaches by Station

Tier 1 Beaches: Monthly Geometric Means by Station (>30 cfu/100 mL in Red)																
Beach Name - Station Number		2016			2017			2018			2019			2020		
		June	July	Aug.	June	July	Aug.	June	July	Aug.	June	July	Aug.	June	July	Aug.
Oakland Beach	1	30.2	12.5	26.3	51.6	75.1	25.5	23.6	16.3	16.7	14.6	10.0	15.9	10.8	23.7	18.5
	2	88.4	13.2	10.0	23.6	22.8	25.7	11.9	28.7	11.7	18.9	10.0	18.8	13.0	10.9	11.7
	3	32.2	24.8	13.9	18.5	38.7	38.4	10.0	19.4	10.8	12.6	10.0	12.2	13.0	37.3	18.2
Conimicut Beach	1	45.8	22.4	14.4	40.0	16.7	10.8	23.1	21.8	13.5	14.7	20.1	18.2	25.5	31.2	39.4
	2	44.8	12.7	10.0	33.5	21.8	15.2	12.6	71.0	17.2	15.8	17.9	17.4	19.4	27.6	35.1
Goddard State Park	1	12.2	14.5	17.6	16.9	12.2	12.8	20.6	82.2	16.0	10.0	13.6	17.0	16.9	12.6	15.5
	2	12.3	11.5	13.6	16.5	37.5	11.3	27.8	21.3	13.2	14.6	13.3	18.6	19.9	11.5	17.2
	3	14.0	24.7	16.3	20.8	10.0	10.8	31.9	39.0	11.7	10.0	16.4	17.3	15.8	16.3	10.0
Barrington Town Beach	1	17.0	11.6	12.0	15.1	17.9	13.8	16.1	12.2	18.3	16.5	16.1	13.1	15.9	11.2	13.4
	2	13.7	10.5	14.6	17.4	22.6	13.0	16.5	12.8	19.5	14.8	17.0	13.3	11.5	14.5	15.3
Warren Town Beach	1	17.0	13.2	16.8	21.2	17.1	27.6	13.3	13.0	17.7	15.5	19.6	13.0	23.8	16.0	15.0
Bristol Town Beach	1	22.4	15.0	21.1	24.2	14.0	10.8	27.5	10.0	15.7	10.0	13.0	17.2	12.0	10.0	10.0
	2	16.5	12.6	16.9	17.7	13.8	10.0	20.5	11.9	18.3	14.8	15.9	10.9	12.6	10.0	11.3
City Park Beach	1	14.7	10.0	10.0	18.6	15.0	10.0	26.0	10.0	11.7	11.5	10.0	10.9	10.8	24.5	10.0
Third Beach	1	10.8	10.0	33.0	10.8	28.7	14.1	10.0	13.4	18.4	22.2	26.6	30.1	11.5	34.5	12.0
	2	12.5	11.8	13.6	12.8	26.6	17.5	15.7	11.5	26.9	28.1	47.5	42.1	13.8	37.1	29.3
Peabody's Beach	1	22.8	14.3	14.5	12.9	15.9	19.4	10.0	17.6	15.9	16.0	15.8	12.6	11.7	10.0	20.0
Easton's Beach	1	51.5	28.7	19.1	47.3	28.9	25.4	23.5	17.5	14.2	13.2	48.6	43.0	29.6	40.1	27.9
	2	32.5	20.1	19.2	32.8	41.1	26.2	26.0	36.3	58.9	14.8	73.7	45.6	27.3	38.2	49.3
	3	53.3	13.4	14.7	23.2	40.7	37.2	17.6	11.9	12.2	13.2	21.7	26.7	12.6	41.3	20.1
Scarborough North	1	11.3	11.0	12.6	13.5	15.7	10.8	10.0	13.4	18.2	16.9	27.1	24.6	10.0	21.2	14.8
	2	13.2	10.0	24.6	11.3	26.6	16.5	10.0	17.3	19.8	17.9	39.6	23.3	10.0	17.3	15.2
	3	11.3	10.0	27.9	10.0	15.8	18.1	11.0	13.7	21.4	17.3	32.9	20.7	21.5	15.0	10.0
Scarborough South	1	10.8	10.0	33.0	10.8	28.7	14.1	10.0	13.4	18.4	22.2	26.6	30.1	11.7	25.6	16.8
	2	12.5	11.8	13.6	12.8	26.6	17.5	15.7	11.5	26.9	28.1	47.5	42.1	10.0	33.9	23.3
Sandy Point	1	14.1	10.0	10.0	10.0	41.8	17.6	20.4	13.7	46.1	43.3	22.6	11.9	12.5	12.5	17.3
	2	10.0	14.1	10.0	10.0	34.5	14.1	22.2	17.3	28.6	43.1	19.0	13.2	14.3	10.9	17.3

While not included in the table, there is a second criteria presented in EPA's 2012 Recreational Criteria document; a Statistical Threshold Value (110 cfu/100 ml) to be applied as an instantaneous exceedance in any month when it occurs. The counts for our Tier I beaches were much higher for these criteria, and all beaches had cases of exceedances in almost every year during the period. While both metrics are important, RIDOH considers the geometric mean to be a more reliable measure of chronic impairment, and less subject to outlier data. It should be noted that the raw data (*Enterococcus* counts) used in the analysis only included results from RIDOH sampling. While additional samples are taken and analyzed by private laboratories for each of the Tier 1 beaches, the inclusion of these additional data points would have resulted in substantially different representation of each beach (given that the number of samples collected by private laboratories varies by beach). It also would have introduced other quality assurance uncertainties.

The root causes of beach closures continue to be a concern for the RIDOH Beach Program. While the data show that total seasonal precipitation alone is no longer strongly correlated with the poor water quality that results in beach closures, it may be possible, with extended environmental data sets, to develop better correlative predictors for specific high FIB count conditions. The Beach Program has been tracking meteorological data at eleven weather stations throughout the state, as well as tidal data for each day during the beach season since 2009. The weather data includes precipitation, air temperatures and wind direction/speed. The program also records environmental observations at the time of sampling at each beach. These include local water temperature, prevalence of seaweed in the water and at the wrack line and current and wave observations, as well as numbers and activities of visitors and wildlife type and numbers (generally for birds). All of this information may contribute to statistical modeling to predict water quality conditions (See section 4.2, below).

4.0 BEACH PROGRAM ACTIVITIES AND PROJECTS

4.1 Covid 19 Guidance

The 2020 beach season was marked by the initiation of many restrictive practices to reduce risks from the Covid19 pandemic. The Beach Program Kick-Off meeting was delayed due to the frequent updates and guidance regarding Covid19 throughout the months of May and June. The RIDOH Beach Program reached out frequently during this early summer period to provide news and tools to assist beach managers in navigating the Administrative Orders related to Covid19, particularly as they related to the stringent requirements for frequent and thorough cleaning of restrooms, and social distancing in the restrooms and at the beach. Templates for Covid19 management plans and for signage were distributed and the RIDOH Beach Program fielded questions and concerns from beach managers and the public.

During April and May, the Beach Program Manager, Sherry Poucher, was tracking national and international research to determine the potential for contracting Covid19 through the fecal-oral route. Viruses of fecal origin are known to be a major contributor to illnesses associated with recreational water uses, and uncertainty regarding the SARS CoV2 virus transmission via this pathway were of vital concern.

While the research community continues to highlight need for studies to further test the viability of the virus in untreated sewage, some breakthrough research indicated that SARS-Cov-2 is inactivated in the lower gastrointestinal tract. The research, led by Washington University Medical School (Zang et al., 2020) found SARS-CoV-2 RNA in fecal samples but could not "recover any infectious virus using a highly sensitive cell-based assay." This research, along with considered expert opinion, supported the premise that there is very low potential for contracting Covid19 from feces/raw sewage carried into swimming waters.

4.2 Beach Season Kick-Off Meeting

Each year the Beach Program holds a topic-based meeting for beach owners/managers, cities/towns, state agencies, laboratories, and any interested stakeholders. Meetings may include guest speakers knowledgeable in the applicable topic as well as federal representatives to answer questions and concerns.

The 2020 Kick-Off Meeting was held on July 9, 2020, virtually, due to Covid19. The meeting was held via Zoom and was recorded. Jennifer Ogren, Deputy Chief of the RI DEM Parks and Recreation and point person for State Beaches, presented information regarding Covid19-related requirements. Before and after the meeting, there were numerous communications to the entire community of practice for the Beach Program, explaining Administrative Orders and guidance specific to beaches, with respect to Covid19.

Sherry Poucher presented findings from preliminary statistical modeling that might lead to a predictive capability for high-risk beaches, as well as 2020 results from saltwater and freshwater monitoring.

4.3 Statistical Analysis and Predictive Modeling

During 2019, RIDOH completed a collaborative project with the non-profit organization Clean Ocean Access (COA) to improve our understanding of current marine beach water quality status and trends at Rhode Island beaches. Our work was partially supported by the New England Interstate Water Pollution Control Commission (NIEWPCC). The 2018-2019 project was conducted for the Narragansett Bay Estuary Program (NBEP) to address analytical shortcomings identified in the State of Narragansett Bay Report (NBEP 2018, Chapter 23, Saltwater Beaches). We leveraged $16,000, split between RIDOH and COA, to advance the work. The project reached beyond the beach closure data to evaluate raw water quality monitoring data (*Enterococcus* concentrations) for trends. The project also used a statistical modeling software package developed and supported by U.S. EPA, “Virtual Beach”, to find combinations of factors that predict water quality at individual sites.

Methodologies were developed and reported for case studies for two beaches with historic and persistent water quality problems: Oakland Beach in Warwick and Easton’s Beach in Newport. The first task was to analyze raw *Enterococcus* data (2006-2018) to establish status with respect to state water quality standards, and to evaluate trends over time. For most years, the data records for Oakland and Easton’s beaches did not meet either of EPA’s specific water quality standards for recreational use, albeit conditions were acceptable for recreation more days than not in any given season. Analyses using R software and Mann-Kendall tests found that neither beach exhibited any significant trends in water quality.

The next task was to develop statistical models using Virtual Beach. Data sets containing environmental variables that were temporally associated with *Enterococcus* concentration served as the input to predict counts of the bacteria. For each beach, 2015-2017 data formed the basis for the models. Guidance dictates that the data sets must be representative of current conditions, which is why the number of years of data was limited. If successful, the models could be used to predict water quality for more timely and appropriate management actions to better protect public health. They might also, through inference, provide clues to better understand root causes of contamination. The case-study work supported by NEIWPCC was completed during the first half of 2019.

An important finding was that the environmental variables found to be statistically significant predictors of *Enterococcus* were different for each beach, and that no single variable was a good predictor. At Oakland beach, rain and tide variables along with depth to groundwater were found to be statistically significant predictors. Easton’s beach models did incorporate rain factors, but water temperature and operation of Newport’s UV Disinfection Treatment Plant were also important factors. Although the models for both sites demonstrated strong relationships between the predictors and measured *Enterococcus* concentrations, they were not successful at predicting 2018 *Enterococcus* counts. This may due to some unique conditions during sampling events in 2018, as well as lack of representation of the specific conditions found to be predictive of poor water quality in the base model years. While the base models met statistical standards for acceptability, their predictive capacity would most likely improve if they were augmented with more years of data. Individual case study reports and the integrated final report are available on request (McLaughlin et al., 2019).

During the second half of 2019, the data set used to develop the Oakland Beach model was applied toward the development of potentially predictive capabilities for six additional Upper Narragansett Bay beaches. Given the large time commitment required to develop model data sets, this work intended to test whether a single set of explanatory environmental data might be useful for multiple beaches located within close proximity. While the range of model fits was variable, the base year model fits did generally meet acceptability criteria. Again, we found that the predictive variables were unique to each beach. Unsurprisingly, the models seem to perform best for beaches with the highest counts of *Enterococcus*.

4.4. Investigation of New Rapid Testing Technology (TECTA)

From 2019 through 2020, the Beach Program started to investigate the value of TECTA, a new technology that could provide an alternative to IDEXX *Enterolert*, allowing reportable test results in a shorter time frame. The technical basis for the test is similar to *Enterolert*, using similar selective media and an enzyme reaction that produces a fluorescent signal. TECTA's advantage is that it uses the relationship between detection time and concentration, allowing the quickest reporting for high concentrations. Compared with *Enterolert*, TECTA costs are roughly equivalent, and TECTA also has some automation advantages.

The Beach Program conducted a preliminary trial with TECTA (instrument on loan from the developer, Pathogen Detection Systems, Inc.) during the summer through winter of 2019-2020. RIDOH's methods for testing TECTA built on experience gained in our earlier studies with quantitative polymerase chain reaction (qPCR), another method with a relatively short test turn-around-time, but which proved more costly and logistically problematic (see Section 4.6, below).

Through our partnership with the State Health Laboratory, RIDOH conducted TECTA testing in parallel with the *Enterolert* (ENT) and Membrane Filtration (MEI) standard methods. We began with field samples spiked with *Enterococcus faecium* and *Enterococcus faecalis* over a range of relevant concentrations. However, the standard testing methods are based on data that show nearly all live cells in culture will produce an enzyme signal by the test endpoint. In contrast, the technical basis for TECTA is the relationship between the strength of the enzyme-mediated signal and time, where the predictability of time to detection vs concentration is dependent on the growth characteristics of the bacteria. Pathogen Detection Systems, Inc determined that reference cultures of *E. faecium* and *E. faecalis* did not necessarily have the same growth characteristics as *Enterococcus* species in natural environments. Therefore, spiked field samples were not as representative for TECTA as for other test methods with a single time endpoint.

For this reason, RIDOH worked to obtain data by testing beach samples with elevated counts under summer conditions, to apply EPA's protocols for the development of Alternative Recreational Criteria and 'validate' the TECTA method. One problem encountered was the summer of 2020 was characterized by a record low number of high-count samples.

We compiled Enterococcus final count and geometric mean exceedances over 60 cfu/100 mL for all three methods of TECTA, ENT and MEI for a total of 79 data points. The error rate of TECTA, detailing the occasions when TECTA did not match Enterolert in its determination of an exceedance, was 29% of exceedances by ENT results. The error rate for the total exceedance results of TECTA compared to ENT exceedance results was also 29%.

Using the total set of 79 data points, we established different subsets of data to complete a multi-parameter, comprehensive assessment. The discriminators were selected based on a hypothesis that each variable influenced the comparability of the methods. Through systematic inclusion or exclusion of specific qualifiers including: 1) samples analyzed the day after collection vs same day TECTA analysis, 2) spiked samples of both *E. faecalis* and *E. faecium* or only *E. faecium* dilutions, and 3) use of expired TECTA cartridges. We conducted linear regression analyses to estimate the relationship between the three methods, while including and excluding the above variations.

Figure 3. Natural Logarithms (LN) of TECTA Results vs Natural Logarithms (LN) of Enterolert Results

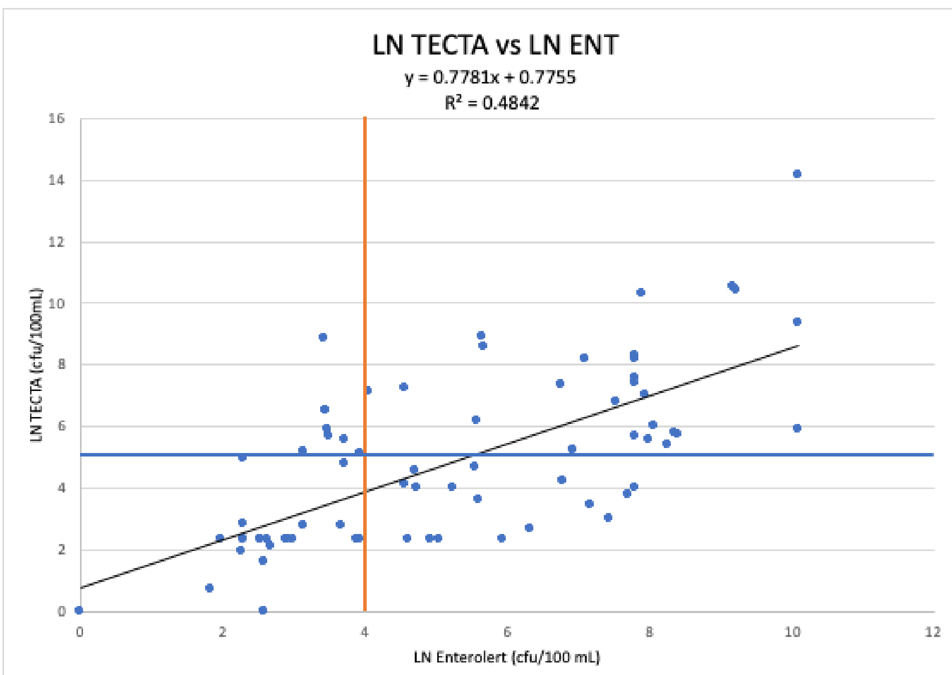
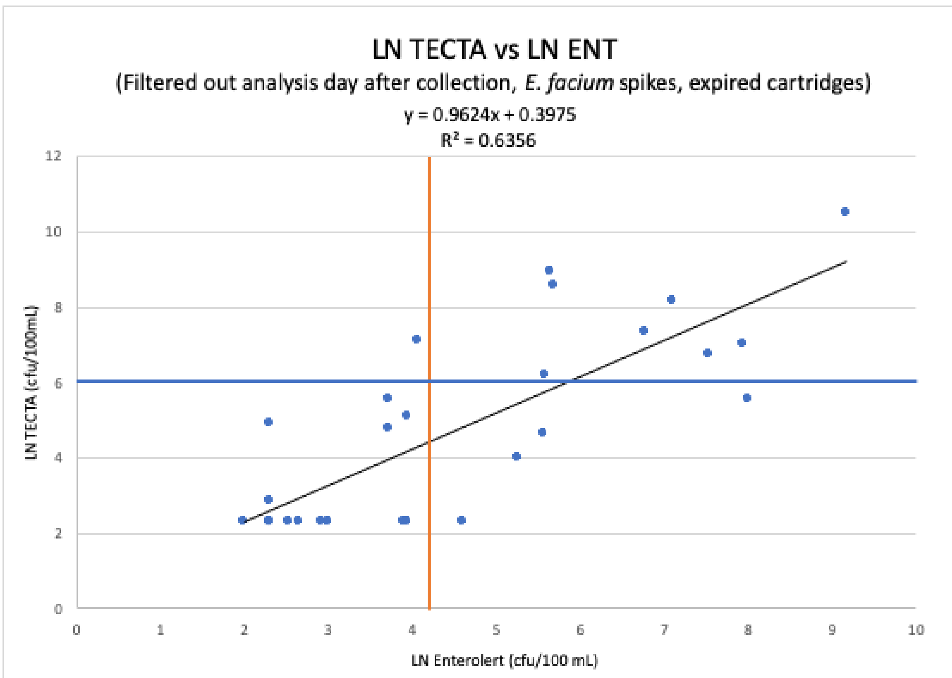


Figure 3 above represents the relationship between the Enterococcus final count and geometric mean exceedances determined by TECTA and Enterolert, presenting an R^2 of 0.48. The regression analyses with the removal of results from samples held at 4 degrees C for one day prior to analysis also produced an R^2 of 0.48. Similarly, removal of spiked samples also resulted in an R^2 of 0.48. The removal of both day after samples and *E. facium* spiked samples produced an R^2 of 0.46. A similar comparison using the averages of Enterococcus instead of the geometric means presented a lower correlation in the relationship between TECTA and Enterolert. Through the exclusion of the same variables mentioned above, the R^2 values using simple averages varied from 0.41, 0.37, 0.32 and 0.39, respectively.

In early September of 2020, we also encountered an issue of using testing cartridges that had expired by TECTA standards. Consequently, we conducted the analysis of final counts and geometric mean exceedances after the removal of day after collection TECTA analysis samples, *E. facium* spiked samples and data obtained using expired cartridges. As shown in Figure 4, there was an improved relationship between TECTA and Enterolert (R^2 value of 0.64) with this data set.

Figure 4. LN of TECTA Results vs LN of Enterolert Results (Filtered out analysis day after collection, *E. facium* spikes, expired cartridges)

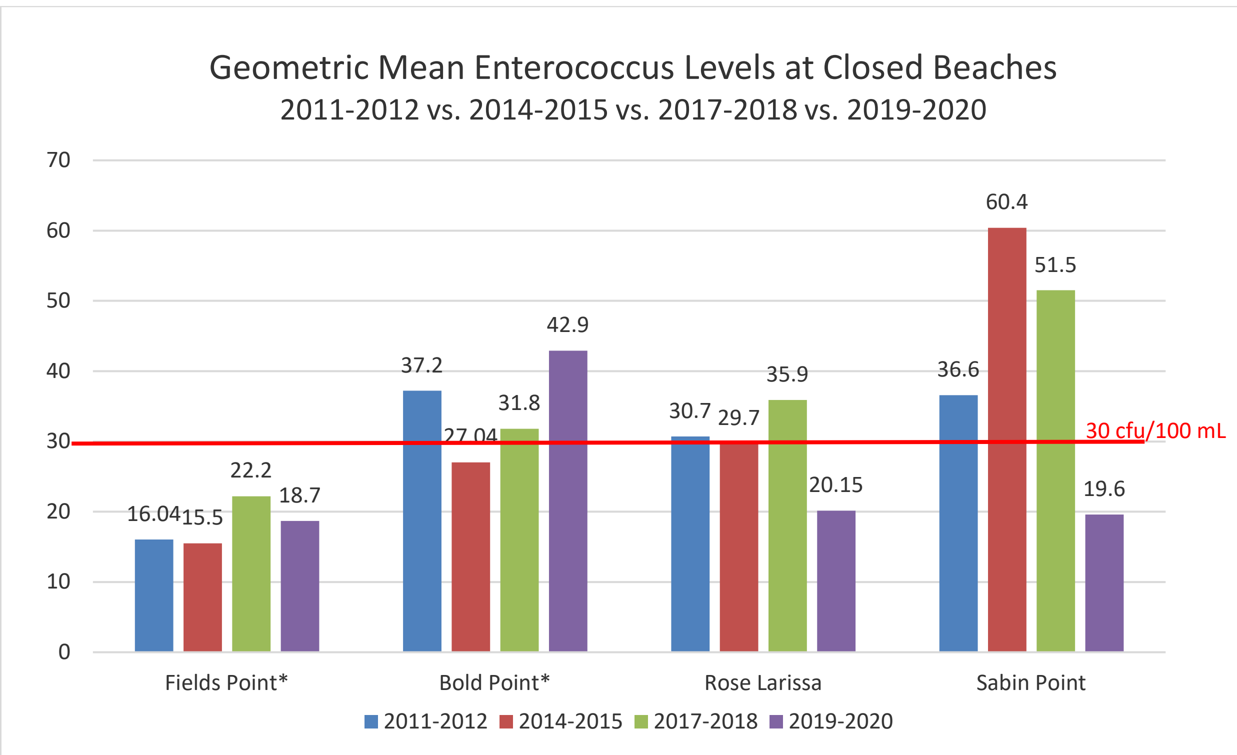


Ultimately, the findings from the TECTA trials showed promise, especially considering that differences between the methods were expected. One benefit of the TECTA method is that it concentrates bacterial cells to the bottom of the test chamber, and thereby avoids color interference in the sample (a potential drawback of the Enterolert method). However, the TECTA method still has a longer incubation period than would be optimal and would result in "next-day" advisories. Given the rapid changes in conditions at many beaches, it is incumbent on us to find a method more like a litmus test, where the public could be alerted to health risks as near as possible to the times when they occur.

4.5 Urban Beach Initiative

The Urban Beach Initiative is an ongoing study. In 2018, RIDOH completed the formal study to statistically examine status and trends of water quality at four areas in upper Narragansett Bay: Bold Point and Fields Point in Providence, and Rose Larissa and Sabin Point in East Providence. The objective was to determine if these locations might prove to be suitable for primary contact recreation. The formal study was reported by John Snow Inc. (JSI). It included data from 2011 through 2015, but analysis consistent with the JSI study continues with additional data collected through 2019. Due to the paucity of *Enterococcus* data (9 to 29 sample days per year), the JSI analysis grouped results from the years 2011 and 2012 to compare with results from 2014 and 2015. The years 2013 and 2016 were excluded from the analysis because only two beaches, Fields Point and Sabin Point, were sampled. Importantly, data from these years were neither the highest nor lowest over the study period. It is also of note that 2013 was a heavy rain year (20.4"), outside of the 99% normal distribution of the rainfall for the decade period.

Figure 4. Enterococcus at Non-licensed Urban Beaches (Geometric Mean Pooled by Year)

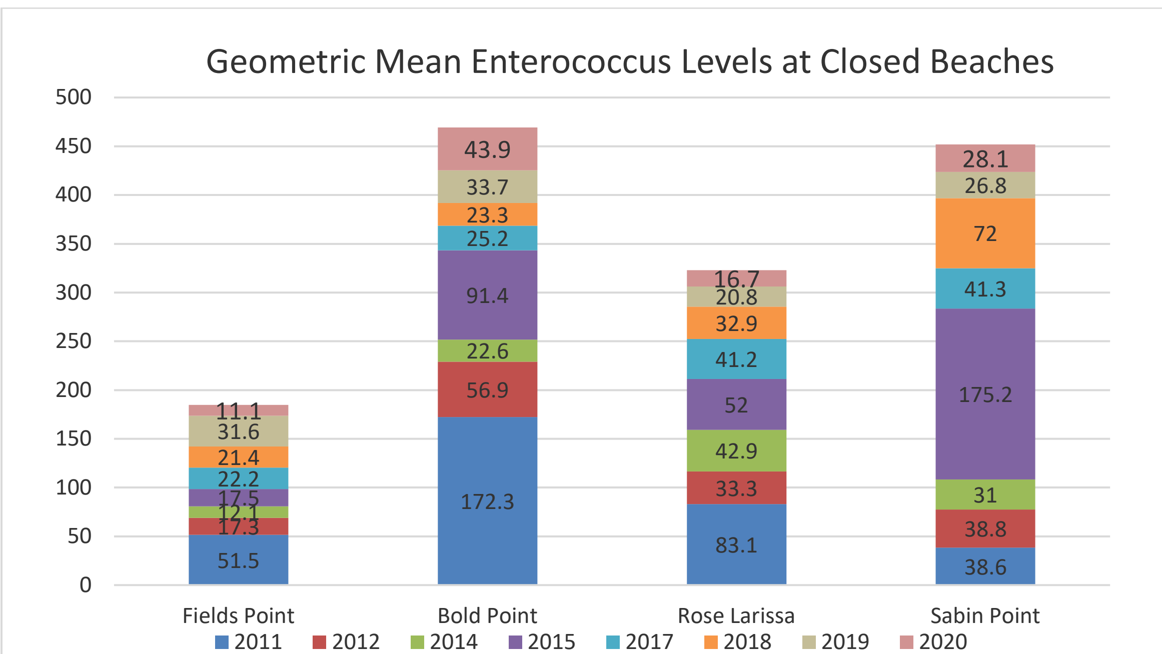


Results from the JSI study, as summarized above (Figure 4), indicate that recent conditions at Providence's Fields Point were better than at East Providence's Bold Point. Additionally, Bold Point appeared to have been improving until the increase in geometric mean from the recent years of 2019-2020. Data from both sites are courtesy of collaboration with Save the Bay, whose staff has sampled locations since the initiation of the Urban Beach Project. Save the Bay sampled once per week at Fields Point and Bold Point in contrast with the biweekly sampling at Rose Larissa and Sabin Point conducted by RIDOH.

At Bold Point, while wastewater treatment plant upgrades are ongoing, they have lagged behind the major improvements which were completed at the Field's Point treatment plant by 2014. Fields Point appears to be approaching conditions at three urban beaches that are open for swimming, Barrington, Warren and Bristol town beaches. At these town beaches, annual geometric mean concentrations are generally near 20 cfu/100 ml or less.

During 2017-2018, the East Providence beaches, Rose Larissa and Sabin Point, had geometric means > 30 cfu/100 ml which, as noted above, is one of U.S EPA's recommended criteria to determine impairment for recreational use. At these East Providence sites, local inputs may be contributing to the persistent water quality problems. However, the pooled data of 2019-2020 indicate an improvement, as it demonstrates a significant decrease in geometric mean for both Rose Larissa and Sabin Point at 20.15 and 19.6, respectively. For 2020 alone, the results from Fields Point, Rose Larissa and Sabin Point beaches show an overall improvement, with yearly geometric means of 11.1, 16.7 and 28.1 cfu/100 ml, respectively (Figure 5).

Figure 5. Enterococcus at Non-licensed Urban Beaches (Geometric Mean Stacked by Year)



The urban beaches should be a priority for additional management actions, whether for the continued need for pathogen load reductions, or, where conditions have improved sufficiently, to develop the community infrastructure that would promote recreational use. During the hot summer months, many Rhode Islanders use recreational beaches as sanctuaries to escape the heat. Populations most in need are those living in Rhode Island's urban core, where buildings and pavement heat retention elevates temperatures through the "heat island effect". These populations are also some of the most at risk in the state for water-borne illness as social and economic restraints interfere with access to cleaner, more costly water bodies. Southern Rhode Island waterbodies may also not be accessible to at-risk communities due to restrictions in public transportation. Working to create clean, healthy, and safe recreational outlets for at-risk communities is an integral part of the BEACH Program's mission.

Bristol Town Beach is a preeminent and nationally acclaimed example for how to re-claim an underutilized recreational water asset. The comprehensive program in Bristol demonstrated that combining best management practices to improve water quality with local initiatives such as camps and other promotions of recreational uses have leveraged the beach resource to develop an exceptional asset for the town.

2020 marked the Urban Beach Initiative's tenth season. Since the start of this project, monitoring locations and schedules have been adjusted to potential bather population as well as municipal interest in opening a recreational outlet. For example, Save the Bay added Stillhouse Cove in Cranston to their weekly monitoring effort beginning in 2016. RIDOH will continue to collaborate with Save the Bay as we examine water quality in upper Narragansett Bay. We will also continue to work with Save the Bay to assist with training water quality monitors and to provide grant guidance and application support for remediation work at the beaches.

4.6. Quantitative Polymerase Chain Reaction (qPCR) Rapid Testing

The qPCR study was successfully completed in 2018. The first objective was to build capacity to perform quantitative Polymerase Chain Reaction (qPCR; EPA Method 1609) to quantify fecal indicator bacteria, *Enterococcus,* in beach water samples. The State laboratory is now fully competent and practiced in this method. The other objective was to establish the utility of the method for beach water quality testing in Rhode Island. Unfortunately, the method, tested on two of the most severely impacted beaches in the state, did not prove to be a reliable surrogate for other EPA approved methods (*Enterolert* and Membrane Filtration). Nonetheless, the new qPCR capabilities at the laboratory can be used for enumeration and for targeting pathogenic strains of *Vibrio*, as well as for rabies confirmation and for various microbial source tracking functions. Having completed qPCR training and analysis of over 400 samples for this study, it is expected that additional applications would require little if any further training.

The project methods and findings are detailed in two reports, one completed through contract support for statistical analysis provided by the John Snow Institute (JSI). The second is a manuscript-style report which includes study background, information regarding experimental design, and a discussion of findings in the context of methodological uncertainties as well as practical application limitations of the method as a routine tool for beach water quality monitoring. The project was funded through USEPA's grants for research within Southeast New England Coastal Watersheds (SNEP).

4.7 Publication of the Beach Sands Study

In 2009 the BEACH Program investigated bacterial contamination in sand at 10 coastal beaches throughout Rhode Island. Eight of the 10 locations have known sources of contamination and close due to high bacteria levels on a regular basis. Sand and water samples were collected along with data on wind speed, direction, wave intensity, and precipitation.

The study was published in the Journal of Environmental Health (Coakley et al., 2016). The study reported statistically significant gradients in *Enterococcus* concentrations among tidal zones, with dry (supra-tidal, or above high tide mark) sand having the highest level, followed by wet (intra-tidal, or below high tide mark) and underwater sand. There were two beaches without a statistically significant gradient (Easton's Beach and Conimicut Point); for these beaches, mean levels were uniformly high in all three zones. Beaches with higher wave action had significantly lower *Enterococcus* count levels in wet and underwater sand compared to beaches with lower wave action. Results from the sand study are just a first step. Further investigation with respect to fate, transport and associated exposure risks is needed.

5.0 2021 PROJECTED ACTIVITIES

5.1 Monitoring Program

Beach interns will conduct sampling at coastal beaches from Memorial Day through Labor Day. Approximately 1600 samples will be collected, submitted, and analyzed for *Enterococcus* during the summer season.

5.2 Illness Tracking

The BEACH Program will work with the Division of Infectious Disease and Epidemiology to research and develop standard operating procedures for tracking and responding to water-borne disease and illness.

5.3 Data Submission

The BEACH Program will prepare both notification and monitoring data for submission to EPA's Environmental Exchange Network Services Center. Verification of the submittals, and updates and corrections in historic data will be accomplished using EPA's new Verification Tool, and with assistance from EPA contract staff.

5.4 Reporting

<u>Annual Season Report</u>

Reporting of previous year's data will be prepared and submitted to EPA Region 1 as required. The Season Report will include analysis and descriptions of data collected and trends affecting the beaches and water quality of Rhode Island.

5.5 Outreach

2021 Beach Season Kickoff

The Beach Program will hold a one-day meeting for beach owners, managers, and interested stakeholders to kick-off the summer season. Each year is a unique theme with presenters and take-home materials on the day's topic. The annual kick-off meeting also provides an opportunity for beaches to ask questions, sign up for summer training and events hosted by RIDOH and to network with other beaches and state officials.

Governor's Beach Day

The RIDOH Beach Program conducts a summer education and outreach event during the annual Governor's Beach Day, generally held during the last weekend in July. Two sampling interns man a table for beach visitors interested in learning about water quality and healthy beaches. Some of the activities include an Enviroscape presentation, Beach Bingo, Beach Trivia, and Scavenger hunts. Other outreach activities can be scheduled for a "Beach Program at your Beach," on request, on Friday's when sampling does not occur. Beach managers and camp supervisors are required to oversee these events. Beaches are notified of this opportunity at the annual Kick-off meeting. 2021 will be the tenth year for this option.

5.6 Risk Assessment

Sanitary Surveys and Modeling

The Beach Program will assist beach managers and municipal employees to conduct Sanitary Surveys. The surveys identify potential sources of contamination, risks to public health, and environmental impairments leading to the evaluation and classification of saltwater beaches. RIDOH will use the new template and survey guidance recommended in the 2014 Beaches Environmental Assessment and Coastal Health Act Guidance Document to perform these assessments. Beach Program staff will also work with any beach manager who expresses interest in developing and using Virtual Beach modeling predict and close and open their beach.

Rank Beaches by Tier

At the beginning of each season, RIDOH uses our risk-based beach evaluation and classification process to rank beaches by tiers. Using information and data gathered from evaluation of the prior year's beach data, along with sanitary surveys, tier rankings are adjusted needed.

Improving Risk Assessments with New Tools and Initiatives

Over the next three to five years, the Beach Program will work to develop an environmental assessment plan for Rhode Island Coastal beaches. This plan will refresh beach specific information/data such as sources of contamination, stormwater improvement projects, review water quality, and public access. This plan may include the following:

- Site-specific comprehensive assessments for coastal beaches
- Sanitary surveys using USEPA's new template and survey guidance recommended in the 2014 Beaches Environmental Assessment and Coastal Health Act Guidance Document
- Incorporate rapid testing methods, as appropriate
- Data collection to better characterize temporal and spatial variability
- Use of forensic dogs to identify sources and pathways of contamination
- Identification and characterization of the nature and extent of groundwater seepage
- Develop predictive models in areas with known sources of contamination that pose the greatest risk to public health.
- Incorporate predictive models into beach closures/advisories to better protect the public
- Hold stakeholder workshops, sampler training, etc.

5.7 New Recreational Water Quality Criteria Standards

The BEACH Program will complete assessments of Tier 1 beaches, relative to EPA Recreational Criteria and will report these results to the Rhode Island Department of Environmental Management (RIDEM). RIDEM will review annual data and provide a summary of findings in their Integrated Assessment reports. The BEACH Program will also provide beach-by-beach monitoring and notification data.

6.0 REFERENCES

Beaches Environmental Assessment and Coastal Health Act of 2000, 33 USC § 1251 (2012).

Budnick, G.E., R.T. Howard, D.R. Mayo. 1996. "Evaluation of *Enterococcus* for Enumeration of Enterococci in Recreation Waters". Applied and Environmental Microbiology. 62:3881-3884.

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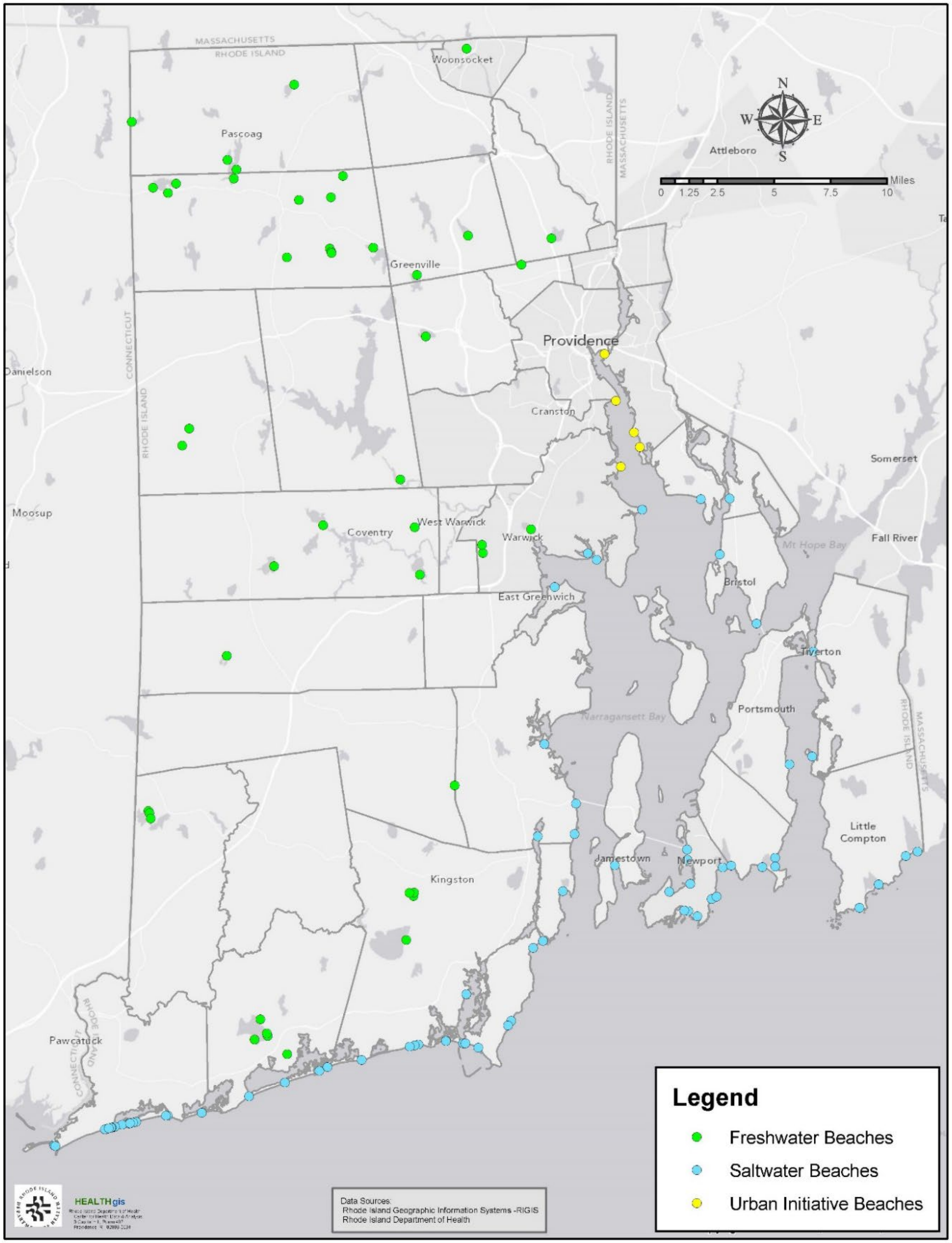
McLaughlin, D, S. Poucher, E. Touhey and J. Chopy and S. Pereira. 2019. Research Needs for Marine Beaches: Final Report, Federal Award Identification Number: CE00A00004
NBEP: Section 320 Funds, NEI Job Code: 318-001, Project Code: S-2018-005, 2018/2019 Grant Program, June 13, 2019

Zang, Ruochen et al., 2020. TMPRSS2 and TMPRSS4 mediate SARS-CoV-2 infection of human small intestinal enterocytes. Sci. Immunol. 10.1126/sciimmunol.abc3582 (2020).

APPENDICES

APPENDIX A

Map of Rhode Island Licensed and Urban Beaches



MASSACHUSETTS
RHODE ISLAND
CONNECTICUT
Woonsocket
Pascoag
Attleboro
Greenville
Providence
Danielson
Cranston
Somerset
Moosup
Coventry
West Warwick
Warwick
Fall River
Mt Hope Bay
Bristol
East Greenwich
Tiverton
Portsmouth
Narragansett Bay
Little Compton
Jamestown
Newport
Kingston
Pawcatuck
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0 1.25 2.5 5 7.5 10 Miles
Legend
Freshwater Beaches
Saltwater Beaches
Urban Initiative Beaches
HEALTHgis
Data Sources:
Rhode Island Geographic Information Systems -RIGIS
Rhode Island Department of Health

APPENDIX B: 2020 Meteorological Data

Available on request