

Alaska Department of Environmental Conservation

Waterbody Field Report

Mission Beach, Buskin Beach, Frye Point (Women's Bay), and Lighthouse Beach (Old Harbor), Kodiak Island, Alaska



Prepared by: K.Wright, G.Ellwanger¹

Abstract

The objective of the study was to assess bacteria concentrations at recreational beaches on Kodiak Island, AK through the Alaska Department of Environmental Conservation (ADEC) Beach Grant Program. This project is overseen by Kodiak Area Native Association (KANA) in partnership with the Sun'aq Tribe of Kodiak, and the Alutiiq Tribe of Old Harbor. Samples were collected at Mission Beach, Buskin Beach, Frye Point, and Lighthouse Beach over two years during the highest recreational months to test for the presence of fecal coliform and enterococci bacteria. Sample results were compared to Alaska Water Quality Standards with the intent of notifying the public of any exceedances. By notifying the public if a sample exceeds the allowable levels, the program helps to prevent illnesses that could result from exposure to contaminated beach water. One sample per site was taken each year for DNA source testing using Microbial Source Tracking. They were tested for human, dog, and bird bacterial sources both years and horse bacterial sources were also tested for in 2024. Only Lighthouse Beach in Old Harbor saw quantifiable levels of bird fecal bacteria, which took place in the 2023 season. There were no detectable levels of fecal bacteria of human or dog at any of the beaches in 2023, and in 2024 fecal bacteria from dogs was detected at Buskin Beach and Frye Point, but was not quantifiable.

¹ Kodiak Area Native Association, project #ACWA-23-11 funded by ADEC from an EPA pass-through grant

Basic Waterbody Information

Table 1. Basic Waterbody Information

Assessment Unit ID	AK_M_2070115_007			AK_M_2070118_000
EPA ID	AK986964	AK394314	AK493433	AK813073
Assessment Unit Name	Mission Beach	Buskin Beach	Frye Point (Women's Bay)	Lighthouse Beach
Location description	Located in Shahafka Cove, approx. 1.3 miles northeast of downtown Kodiak.	North of the Buskin River mouth, approx. 5 miles southwest of downtown Kodiak.	North of Frye Point in Women's Bay, approx. 9.5 miles southwest of downtown Kodiak.	North side of Sitkalidak Passage approx. 1.3 miles east of the Old Harbor Boat Harbor.
Hydrologic unit code	19020701			
Water Type	Marine Beach			
Area sampled	Point sample representing 0.42 miles of coastline.	Point sample representing 0.38 miles of coastline.	Point sample representing 0.33 miles of coastline.	Point sample representing 1.03 miles of coastline.
Time of year sampled	May 30th – September 7th, 2023 May 28th - July 11th, 2024			

Water Quality Evaluation

Background

Mission Beach, Buskin Beach and Frye Point are all recreational beaches located in the City of Kodiak on Kodiak Island, located in the Gulf of Alaska approximately 250 air miles south of Anchorage (Figure 1). Lighthouse Beach is a recreational beach located in the rural community of Old Harbor, on the south side of Kodiak Island (Figure 1). These beaches are popular for fishing, camping, shellfish harvesting and general recreation.

No known monitoring of fecal bacteria has occurred at these beaches before this project, so it was of interest to test the beaches identified above as they all have unique potential sources of bacteria, such as nearby wastewater treatment plants, stormwater drain outfalls, a lake with a

history of sewage spill events, campgrounds, public restrooms, small farms, airports, a military base, ferry and barge passage, wildlife, and pet feces (Figures 2-6). A Quality Assurance Project Plan (QAPP) was developed for this project and is available at beaches.alaska.gov.

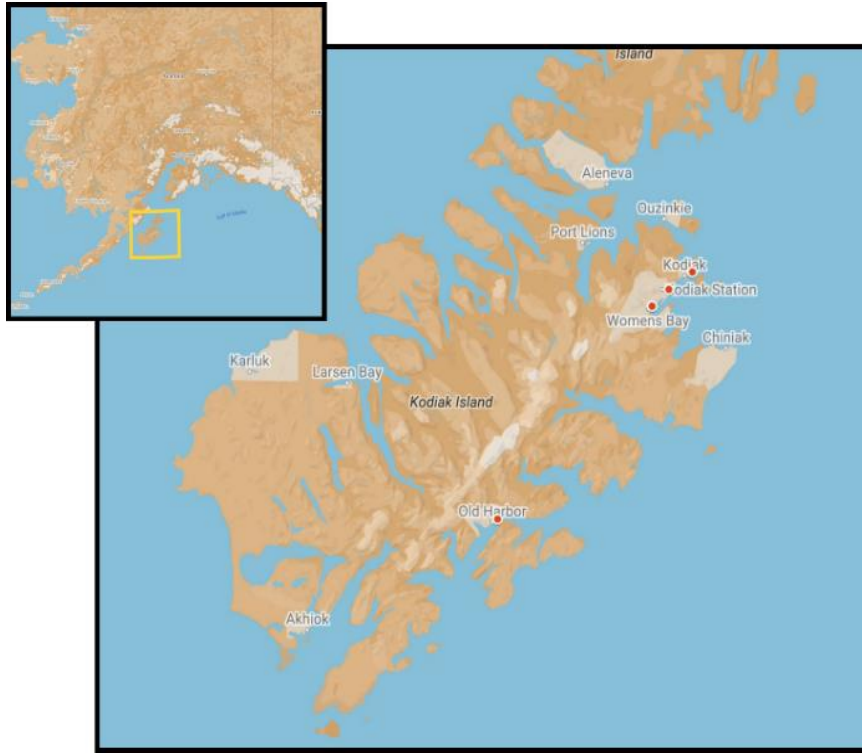


Figure 1. Map of Kodiak Sampling sites in relation to the state of Alaska



Figure 2. Mission Beach, Areas of Interest²

² Not pictured: Kodiak Wastewater Treatment Plant, located .70 miles northeast of Mission Beach

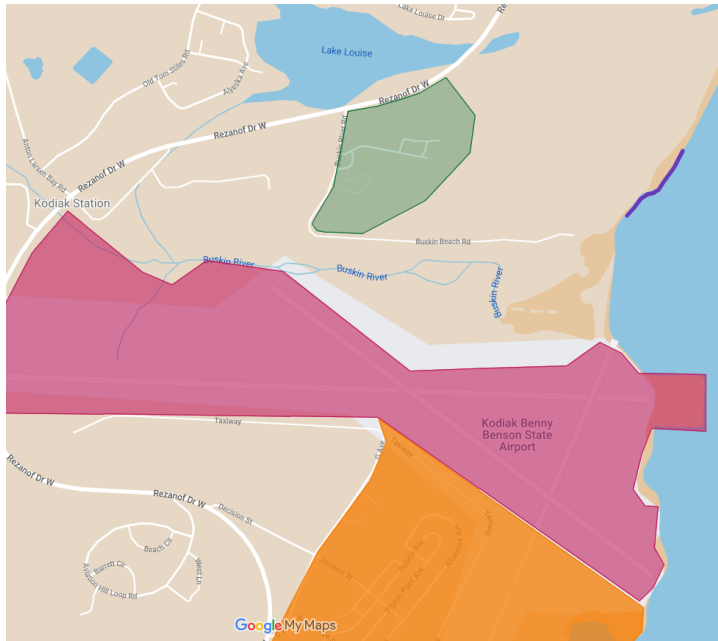


Figure 3. Buskin Beach, Areas of Interest

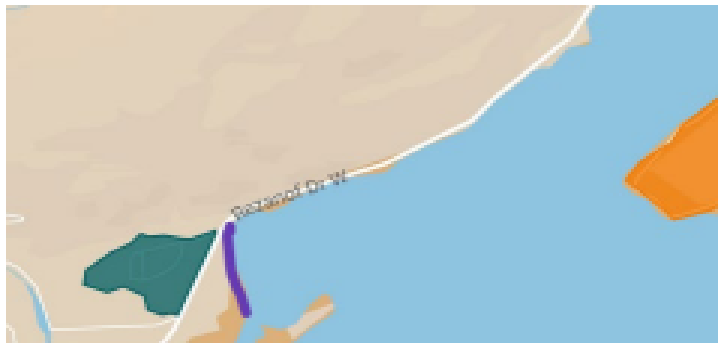


Figure 4. Frye Point, Areas of Interest



Figure 5. Lighthouse Beach, Areas of Interest

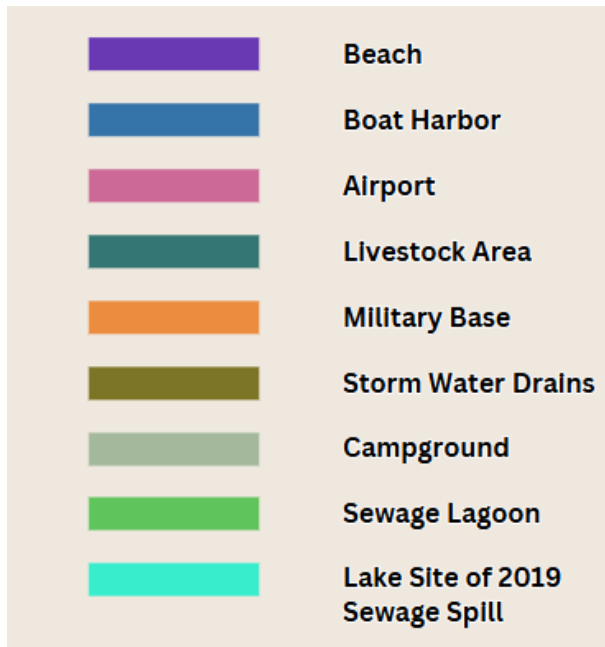


Figure 6. Potential geographic sources of bacteria

Objective

The primary objective of this ADEC BEACH Monitoring Program is to protect human health and the environment by sampling highly trafficked beaches for fecal indicator organisms (fecal coliforms and enterococci bacteria) that signify the presence of fecal contamination. This information was used to identify potential exceedances of allowable levels of indicator organisms and notify the public if sample results exceeded recreational criteria in Alaska Water Quality Standards (WQS)³.

Quality Assurance Review

Field staff followed procedures for sample collection and transport as outlined in the project's QAPP. The ADEC approved QAPP is available at beaches.alaska.gov and from ADEC water quality staff.

In 2023, two samples did not meet the required holding time by the laboratory due to inclement weather, causing delays or cancellations of flights. However, sample cooler temperatures were within limits and no discrepancies, errors, data qualifiers, or QC failures were identified by the laboratory. In 2024, the expected number of samples were collected from the Kodiak city sites: Mission Beach, Buskin Beach, and Frye Point. Three out of seven samples could not be collected from Lighthouse Beach in Old Harbor due to weather and flight delays. The four samples taken on July 11th, 2024, did not meet the hold time due to a laboratory error and were rejected during the quality assurance review. Calibration procedures were performed according to the QAPP and standard of procedures (SOP) at all sites, but the calibrations of the Hanna meter for Lighthouse Beach were only performed at the beginning and end of the sampling season due to lack of buffer solutions in Old Harbor. Any

³ 18 AAC 70 Water Quality Standards amended as of January 8, 2025

environmental data determined to be unreliable due to equipment issues was rejected from the final dataset.

One duplicate sample per analyte per sample event at one location was collected and analyzed. In both years, the relative percent difference (RPD) between the duplicates was calculated for fecal coliform and enterococcus. In 2023, the RPD remained within the goal range of below 60%, but it exceeded 60% in 2024.⁴ The ADEC Quality Assurance Officer was consulted on these RPD exceedances; the final determination was that RPDs were within acceptable range for bacteria analysis. The QAPP-stated completeness goal of 80% was met at 100% in 2023, but in 2024 it was below the goal at 75%.

Methods

In the 2023 recreational season, nine grab samples were scheduled for collection at each site, and seven were scheduled for the 2024 sampling season. The 2023 sampling plan scheduled five samples to be collected at each location within a 30-day period to allow for the calculation of the geometric mean, and the 2024 plan spaced the seven samples over seven consecutive weeks to allow for a rolling geomean calculation. Samples were shipped via Alaska Air Cargo (and additionally Island Air for Lighthouse Beach) to the SGS Laboratory in Anchorage for fecal coliform and enterococci testing through the SM21 9222D and ENTEROLERT analytical methods respectively. To assess precision, a field replicate was collected at one beach during each sampling event, rotating among sites.⁵ Modified EPA Marine Sanitary Surveys were conducted for each beach and sampling date and in-situ water quality parameters (temperature, pH, turbidity) were collected using a hand-held Hanna meter and a Hach turbidimeter. Grab samples for Microbial Source Tracking (MST) were collected once per sampling season at each site and sent to the LuminUltra Laboratory in Linthicum Heights, Maryland.

Results

Only once during the project period was an exceedance of the water quality standards observed; one fecal coliform sample (56 CFU/100ml) at Lighthouse Beach was above the exceedance level (31 CFU/100ml) for the raw consumption of seafood in 2023. The geometric means for fecal coliform and enterococci were well below the exceedance levels at all locations for the recreational seasons of 2023 and 2024 (Figures 7 and 8). One sample for DNA source testing using Microbial Source Tracking (MST) was collected at each location once per year. Only Lighthouse Beach in 2023 saw quantifiable levels of bird fecal bacteria. There were no quantifiable levels of fecal bacteria of human or dog at any of the beaches during these periods of monitoring (Table 2.) The below table and figures represent a summary of results from the 2023 and 2024 sampling seasons for fecal coliform, enterococci, and MST. Please see Appendix A and B for a complete table of all bacteria results.

⁴ See Appendix C for RPD data

⁵ See Appendix C for RPD data

Table 2. MST results for bird, dog, human, and horse bacteria sources, 2023-2024

Sample site	Bacteroidetes	Test Results	
		2023	2024
Mission Beach	Bird	DNQ ⁶	ND ⁷
	Dog	ND	ND
	Human	ND	ND
	Horse	Not Tested	ND
Buskin Beach	Bird	DNQ	DNQ
	Dog	ND	DNQ
	Human	ND	ND
Frye Point	Bird	DNQ	DNQ
	Dog	ND	DNQ
	Human	ND	ND
	Horse	Not Tested	ND
Lighthouse Beach	Bird	1.05E+03	DNQ
	Dog	ND	ND
	Human	ND	ND

⁶ DNQ = Detected, Not Quantifiable⁷ ND = Not Detected

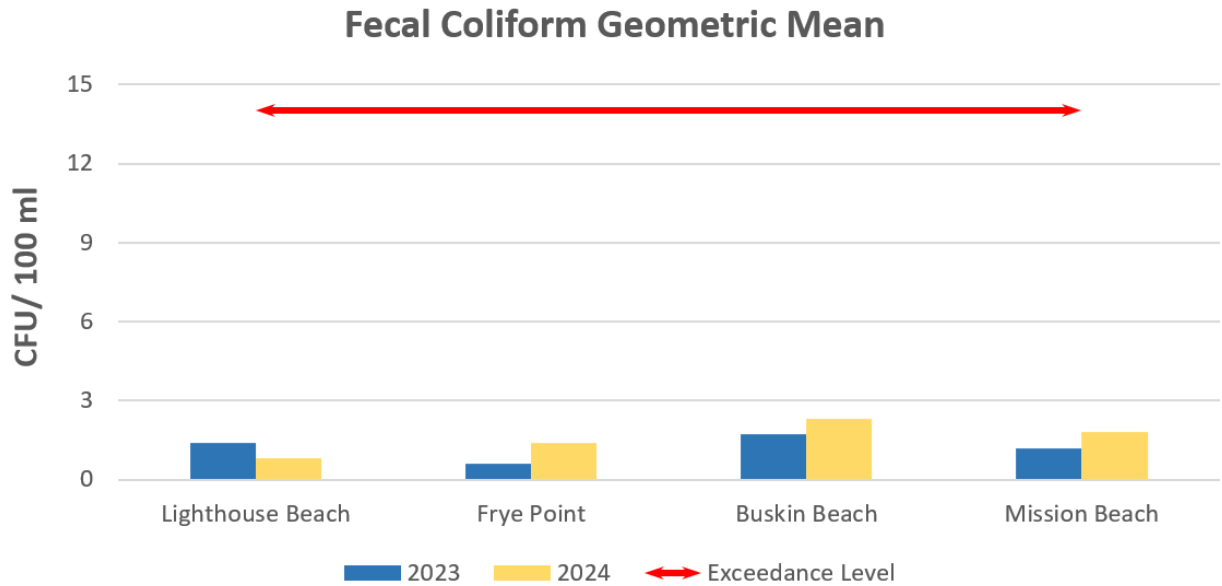


Figure 7. Fecal coliform seasonal geometric means for the 2023 and 2024 sampling seasons. The exceedance for raw consumption is 14 CFU/100 mL.

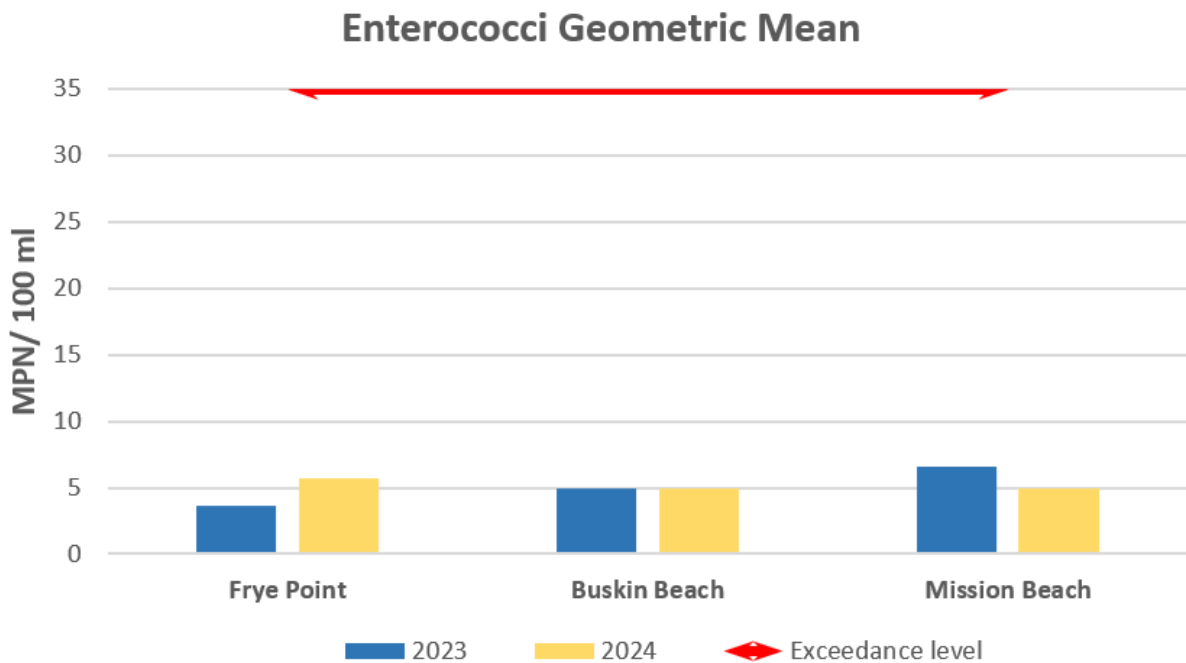


Figure 8. Enterococci rolling geometric means for the 2023 and 2024 sampling seasons. The contact recreation exceedance level is 35 CFU/100 mL.

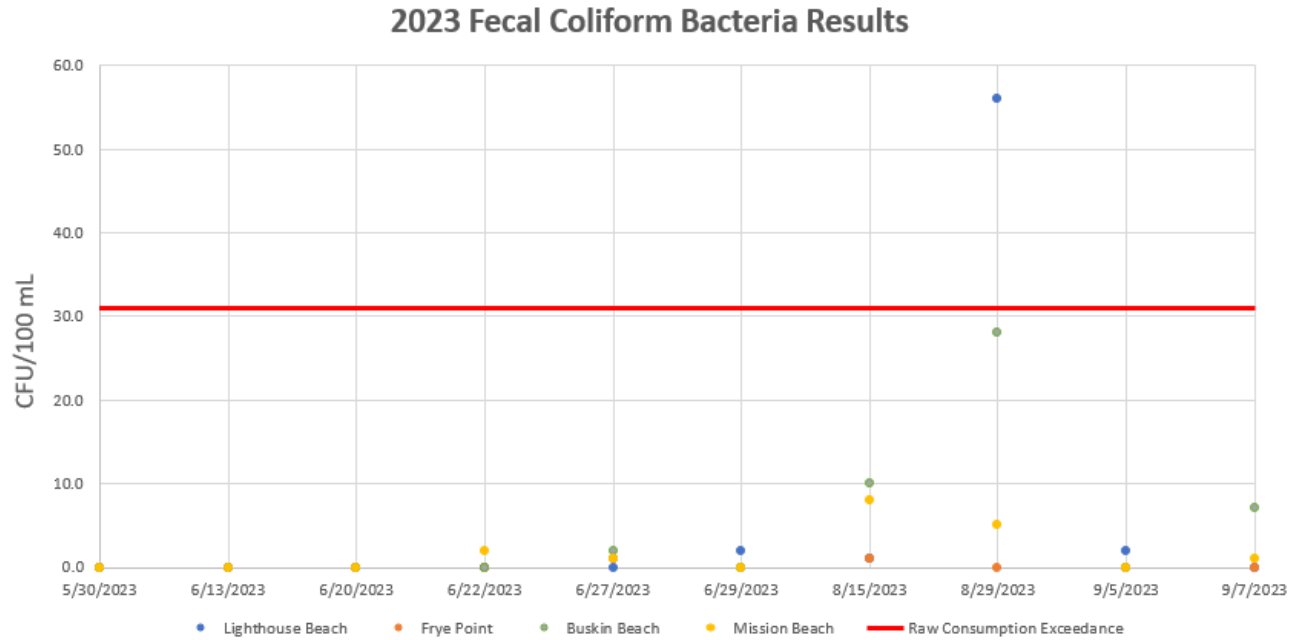


Figure 9. 2023 Fecal coliform bacteria result for all four Kodiak Island beaches, relative to water quality criteria.

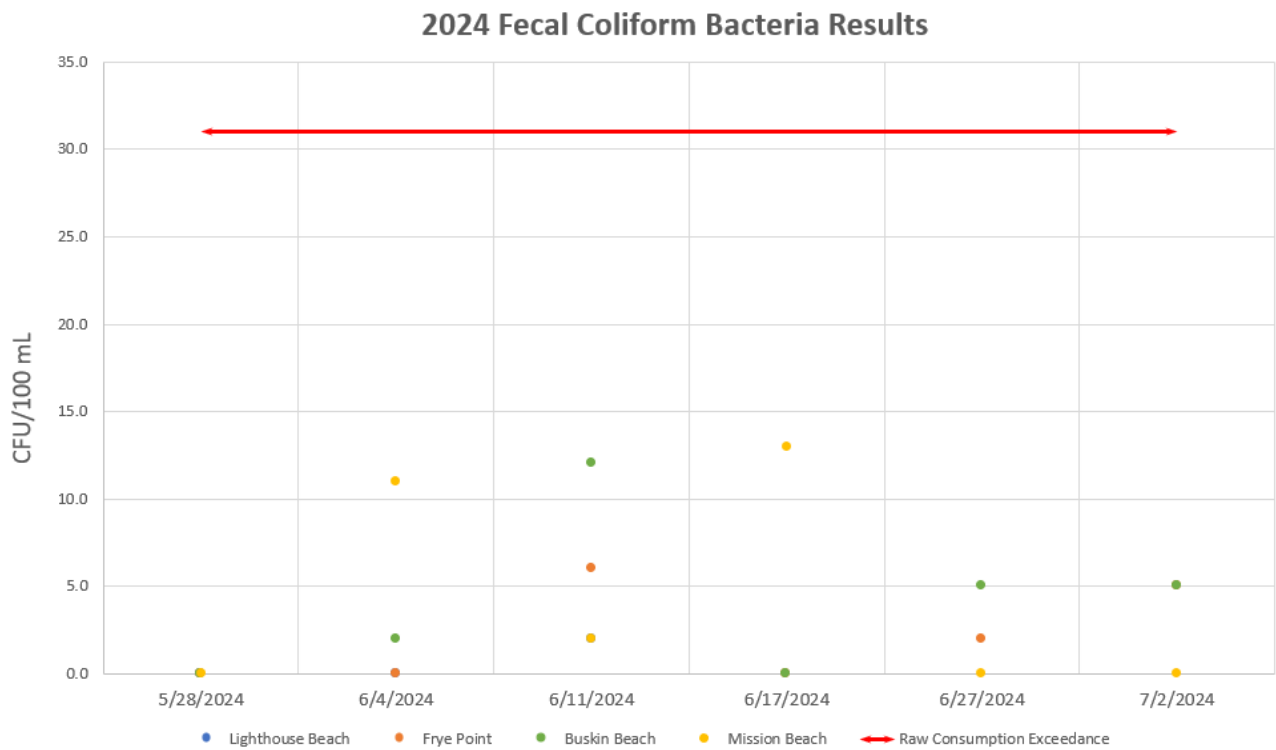


Figure 10. 2024 Fecal coliform bacteria result for all four Kodiak Island beaches, relative to water quality criteria.

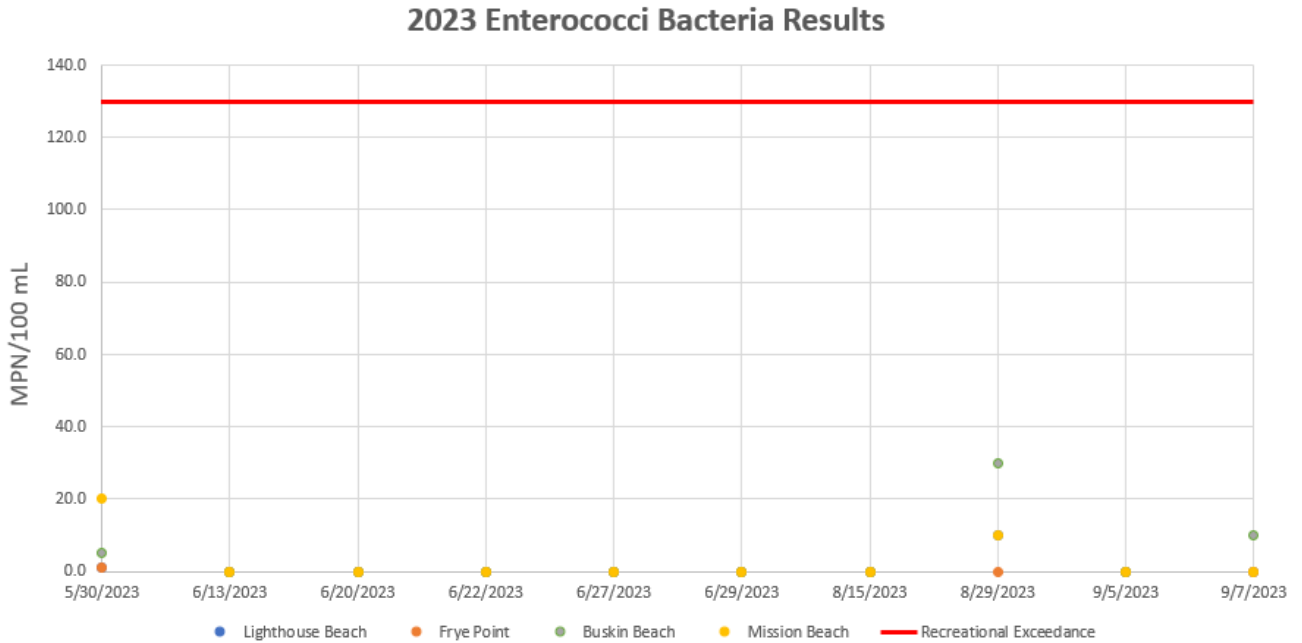


Figure 11. 2023 Enterococci bacteria results for all four Kodiak Island beaches, relative to water quality criteria.

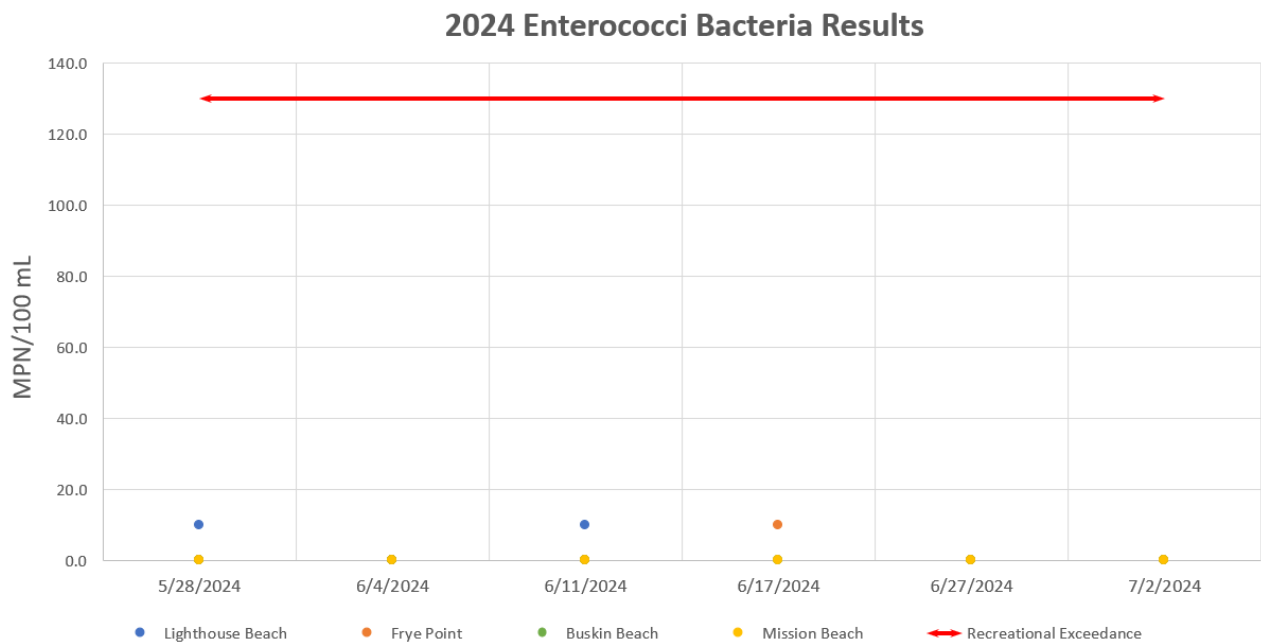


Figure 12. 2024 Enterococci bacteria results for all four Kodiak Island beaches, relative to water quality criteria.

Outreach

ADEC developed a communication plan and released a general press release at the beginning of each monitoring season. The Alaska Beach Program website has a specific Kodiak webpage highlighting an interactive map and data table with the most current beach sampling results, FAQs, and supporting project documents. During the sampling seasons, ADEC shared beach sampling results through a stakeholder email listserv and updated the ADEC website results table and interactive map as soon as analytical data was received. Facebook posts and advisory beach signage were prepared for when water quality exceedances occurred, however, no advisories or beach advisory sign postings were necessary during the 2023 or 2024 recreational season. KANA, the Sun'aq Tribe of Kodiak, and the Alutiiq Tribe of Old Harbor shared Beach Program information via social media and flyers posted around town before and after the monitoring seasons. Outreach events were held following the recreational seasons to share the monitoring program results, summaries, potential bacteria sources, and next steps.

Conclusion

Over the two-year period of marine pathogen monitoring, the WQS's marine water contact recreation limit⁸ was not exceeded at any site and the raw consumption limit was exceeded only once, at Lighthouse Beach in 2023. This resulted in seasonal geometric means that were consistently under the WQS limits for both fecal coliform and enterococci levels. Throughout the project period, MST test results indicated that human sources of bacteria were not detected at any site and canine sources remained undetected or too low to be quantified. Quantifiable avian DNA markers coincided with Lighthouse Beach's 2023 fecal coliform exceedance but were not represented in 2024. Horse MST tests were added at two sites in 2024 to account for local equine recreation, but neither test detected bacteria sourced from horses.

Recommended Next Steps

Given the challenges posed by weather and the inherent logistical complexities of this work, a localized approach is recommended to expand and sustain the impact of the ADEC BEACH project. This two-year project has completed its final year, so we suggest that Tribes with an interest in coastal monitoring are encouraged to apply and participate in expanding the scope of the project. This could involve identifying additional monitoring sites to assess impacts at beaches of local and traditional importance. These communities could use the tools developed through the ADEC, KANA, and EPA collaborations as a foundation for building localized monitoring efforts. These tools include protocols, data collection frameworks, and analysis methods that can be tailored to specific community needs.

⁸ See Appendix D for WQS Criteria

Appendices

Appendix A. Fecal Coliform bacteria results for all four Kodiak Island beaches, 2023-2024

Sample Date	Mission Beach	Buskin Beach	Frye Point (Women's Bay)	Lighthouse Beach
05/30/2023	ND ⁹	ND	ND	ND
06/13/2023	ND	ND	ND	ND
06/20/2023	ND	ND	ND	ND
06/22/2023	2.0	ND	ND	No Sample
06/27/2023	1.0	2.0	1.0	No Sample
06/29/2023	No Sample	No Sample	No Sample	2.0
08/15/2023	8.0	10	1.0	1.0
08/29/2023	5.0	28	ND	56
09/05/2023	ND	ND	ND	2.0
09/07/2023	1.0	7.0	ND	ND
05/28/2024	ND	ND	ND	ND
06/04/2024	11	2	ND	ND
06/11/2024	2	12	6	2.0
06/17/2024	13	ND	ND	No Sample
06/27/2024	ND	5	2	No Sample
07/02/2024	ND	5	5	No Sample

⁹ ND = Not Detected

Appendix B. Enterococci bacteria results for all four Kodiak Island beaches, 2023-2024

Sample Date	Mission Beach	Buskin Beach	Frye Point (Women's Bay)	Lighthouse Beach (Old Harbor)
05/30/2023	20.0	5.00	1.00	1.00
06/13/2023	ND ¹⁰	ND	ND	ND
06/20/2023	ND	ND	ND	ND
06/22/2023	ND	ND	ND	No Sample
06/27/2023	ND	ND	ND	No Sample
06/29/2023	No Sample	No Sample	No Sample	ND
08/15/2023	ND	ND	ND	ND
08/29/2023	10.0	30.0	ND	10.0
09/05/2023	ND	ND	ND	ND
09/07/2023	ND	10.0	ND	ND
05/28/2024	ND	ND	ND	10.0
06/04/2024	ND	ND	ND	ND
06/11/2024	ND	ND	ND	10.0
06/17/2024	ND	ND	10.0	No Sample
06/27/2024	ND	ND	ND	No Sample
07/02/2024	ND	ND	ND	No Sample

¹⁰ ND = Not Detected

Appendix C. 2023-2024 RPD calculations

Beach	Date	Analysis	Detection Limit ¹¹	Sample result	Duplicate result	RPD
Mission Beach	5/30/2023	Enterococcus	10.0	20.0	20.0	0%
Mission Beach	5/30/2023	Fecal Coliform	1.67	ND	ND	0%
Buskin Beach	6/13/2023	Enterococcus	10.0	ND	ND	0%
Buskin Beach	6/13/2023	Fecal Coliform	1.0	ND	ND	0%
Frye Point	6/20/2023	Enterococcus	10.0	ND	ND	0%
Frye Point	6/20/2023	Fecal Coliform	1.0	ND	ND	0%
Mission Beach	6/27/2023	Enterococcus	10.0	ND	ND	0%
Mission Beach	6/27/2023	Fecal Coliform	1.0	1.0	ND	67%
Buskin Beach	8/15/2023	Enterococcus	10.0	ND	10.0	67%
Buskin Beach	8/15/2023	Fecal Coliform	1.0	10.0	17.0	52%
Frye Point	8/29/2023	Enterococcus	10.0	ND	ND	0%
Frye Point	8/29/2023	Fecal Coliform	1.0	ND	1.0	67%
Lighthouse Beach	9/5/2023	Enterococcus	10.0	ND	ND	0%
Lighthouse Beach	9/5/2023	Fecal Coliform	1.0	2.0	ND	120%
Mission Beach	9/7/2023	Enterococcus	10.0	ND	ND	0%
Mission Beach	9/7/2023	Fecal Coliform	1.0	1.0	ND	67%
Mission Beach	5/28/2024	Enterococcus	10.0	ND	ND	0%
Mission Beach	5/28/2024	Fecal Coliform	1.0	ND	ND	0%
Buskin Beach	6/4/2024	Enterococcus	10.0	ND	ND	0%
Buskin Beach	6/4/2024	Fecal Coliform	1.0	2.0	3.0	40%
Frye Point	6/11/2024	Enterococcus	10.0	ND	ND	0%
Frye Point	6/11/2024	Fecal Coliform	1.0	6.0	10.0	50%
Mission Beach	6/27/2024	Enterococcus	10.0	ND	ND	0%
Mission Beach	6/27/2024	Fecal Coliform	1.0	ND	3.0	143%
Buskin Beach	7/2/2024	Enterococcus	10.0	ND	ND	0%
Buskin Beach	7/2/2024	Fecal Coliform	1.0	5.0	1.0	133%

¹¹ When the test result was Not Detected (ND), half of the detection limit was used to calculate RPD.

Appendix D. Bacteria Water Quality Criteria for Marine Water uses, from the 18 AAC 70 Water Quality Standards amended as of January 8, 2025

Designated Use	Criteria
Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 enterococci CFU/100 ml, and not more than 10% of the samples may exceed a statistical threshold value (STV) of 130 enterococci CFU/100 ml.
Harvesting for consumption of raw mollusks or other raw aquatic life	The geometric mean of samples may not exceed 14 fecal coliform/100 ml; and not more than 10% of the samples may exceed; - 43 MPN per 100 ml for a five-tube decimal dilution test; - 49 MPN per 100 ml for a three-tube decimal dilution test; - 28 MPN per 100 ml for a twelve-tube single dilution test; - 31 CFU per 100 ml for a membrane filtration test ¹²

¹² When fecal coliform are monitored in waters designated as state approved shellfish harvesting and growing waters, these waters are also subject to 18 AAC 34.010(19).