TECHNICAL REPORT

Assessment of Fecal Indicator Bacteria Data from 19 North Coast Ocean Beaches

Planning Unit

Planning and Stewardship Division

North Coast Regional Water Quality Control Board

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California Regional Water Quality Control Board

North Coast Region

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1. Introduction – Report Purpose and Scope

In response to pathogen listings on the 2012 Section 303(d) List of Impaired Waters (Section 303(d) List), North Coast Regional Water Quality Control Board (Regional Water Board) staff conducted an Ocean Beaches Monitoring Study, from 2016 to 2018, as part of the Coastal Pathogens Project. Under the Ocean Beaches Monitoring Study fecal indicator bacteria (enterococci and total coliform) data were collected from 11 North Coast ocean beaches. Regional Water Board staff (staff) also obtained additional enterococci and total coliform data collected under the BeachWatch program, between May 2015 and May 2022, from 10 of these same beaches as well as eight additional North Coast ocean beaches. Although BeachWatch program FIB data are available for periods prior to 2015, all available enterococci and total coliform data collected between May 2015 and May 2022 from a total of 19 ocean beaches included in this report have been evaluated to best reflect recent conditions (at the time of conducting this analysis).

Staff evaluated enterococci and total coliform data collected from all 19 ocean beaches to evaluate water quality trends at these beaches. Enterococci and total coliform data collected from all 19 ocean beaches were also screened using the binomial tables provided in the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy) to determine if these ocean beaches meet or exceed the water contact recreation (REC-1) and shellfish harvesting (SHELL) Water Quality Objectives (objectives) for Ocean Waters (State Water Resources Control Board, 2019b). The results of this screening assessment will be considered in conjunction with the technical report "Assessment of Microbial Source Tracking Data and Land Cover and Land Use Data from 12 Ocean Beaches and 22 Coastal Streams in the North Coast Region" (North Coast Regional Water Quality Control Board, 2023a), which evaluates Microbial Source Tracking (MST), land coverage, and land use data collected as part of the Coastal Pathogen Project. Recommendations for next steps related to the Coastal Pathogen Project will be provided in the Coastal Pathogen Project Synthesis report.

Figure 1 presents the 19 ocean beaches assessed in this report[1]. Further details of the Ocean Beaches Monitoring Study and the BeachWatch Program are provided in Sections 3.1.1 and 3.1.2 of this Report. Impairment status details of all 19 ocean beaches for the current (2020/2022) Section 303(d) List are provided in Table A1 (Appendix A).

[1] The figures in this technical report use the term "Sampling Location" when referring to the various sampling stations from where samples were collected as part of the Ocean Beaches Monitoring Study and the BeachWatch Program. The terms "Sampling Location" and "Sampling Station" are interchangeable.

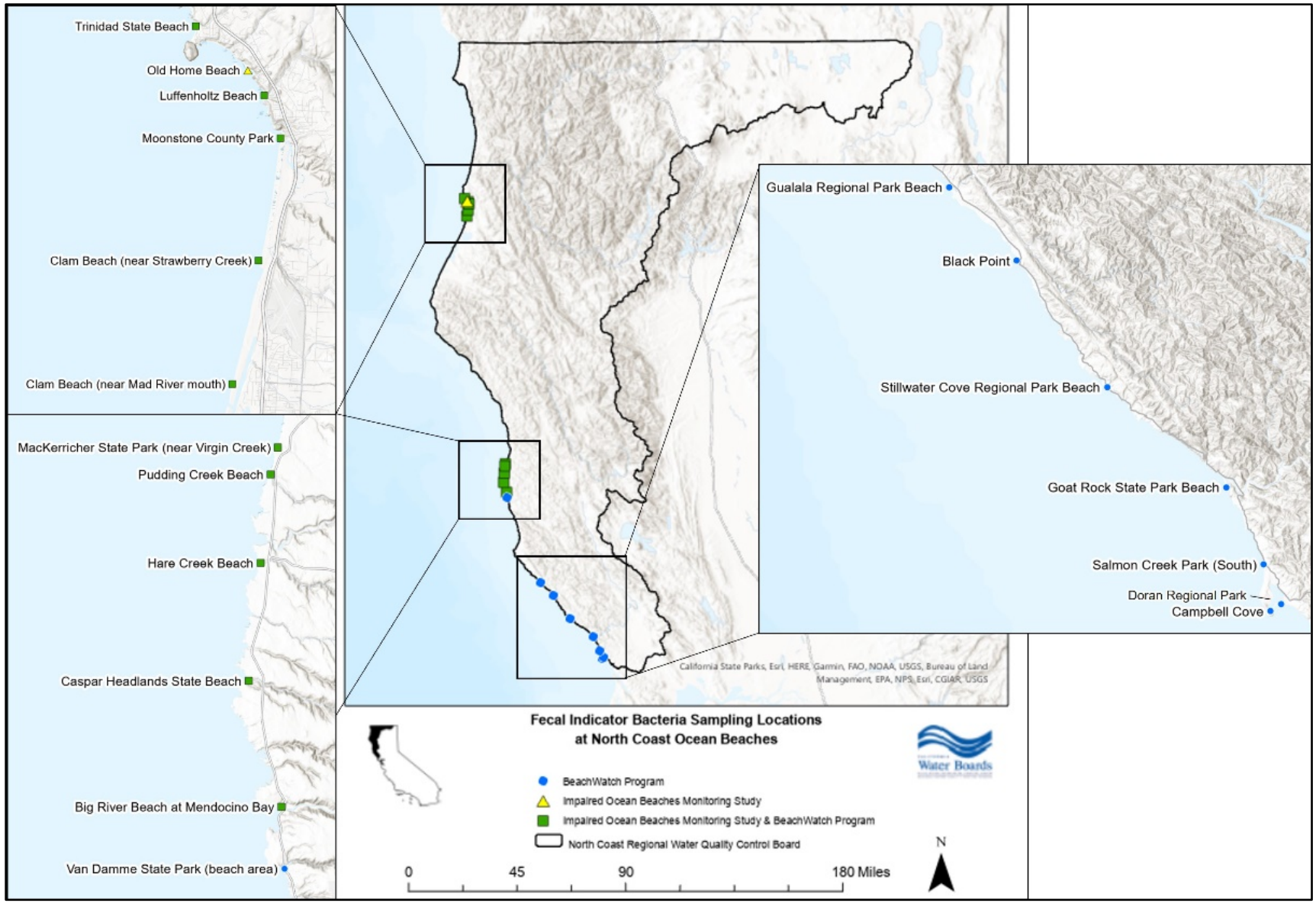

Figure 1 North Coast Ocean Beaches Assessed

2. Statewide Water Quality Objectives for REC-1 and SHELL Beneficial Use

Fecal indicator bacteria (FIB) data from all 19 North Coast beaches included in this technical report were analyzed to determine exceedances of the Water Quality Control Plan For The North Coast Region, (Basin Plan) Water Quality Objectives (objectives) for Ocean Waters (North Coast Regional Water Quality Control Board, 2018). The Regional Water Board Basin Plan establishes that the provisions of the State Water Board Water Quality Control Plan for Ocean Waters of California (Ocean Plan) apply to ocean waters within the North Coast Region (North Coast Regional Water Quality Control Board, 2018; State Water Resources Control Board, 2019b). All enterococci data were compared to the water-contact recreation (REC-1) Objective described in Section 2.1 (State Water Resources Control Board, 2019b). All total coliform data were compared to the shellfish harvesting (SHELL) Objective described in Section 2.2 (State Water Resources Control Board, 2019b).

2.1. Statewide Enterococci Objective for REC-1 in Ocean Waters

As stated in the Ocean Plan, “Within a zone bounded by the shoreline and a distance of 1000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas outside this zone used for water-contact sports, as determined by the Regional Water Board (i.e., waters designated as REC-1), but including all kelp beds, the following water quality objectives shall be maintained throughout the water column” (State Water Resources Control Board, 2019b).

Enterococci

A six-week rolling geometric mean (GM) of enterococci not to exceed 30 colony forming units (cfu) per 100 milliliters (mL), calculated weekly, and a statistical threshold value (STV) of 110 cfu/100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner.

Table 1 Enterococci REC-1 Water Quality Objective for Water-Contact in Ocean Waters (State Water Resources Control Board, 2019b)

Objective Elements	**Estimated Illness Rate (NGI): 32 per 1,000 water contact recreators**	
	Magnitude	
Indicator	GM (cfu/100 mL)	STV (cfu/100 mL)
Enterococci	30	110
The waterbody GM shall not be greater than the applicable GM magnitude in any six-week interval, calculated weekly. The applicable STV shall not be exceeded by more than 10 percent of the samples collected in a CALENDAR MONTH, calculated in a static manner		
NGI = National Epidemiological and Environmental Assessment of Recreational Water gastrointestinal illness rate	GM = geometric mean STV = statistical threshold value cfu = colony forming units	mL = milliliters ppth = parts per thousand

2.2. Statewide Total Coliform Objective for SHELL in Ocean Waters

The Ocean plan specifies that, " all areas where shellfish may be harvested for human consumption, as determined by the Regional Water Board, the following bacterial objectives shall be maintained throughout the water column (State Water Resources Control Board, 2019b):

The median total coliform density shall not exceed 70 per 100 mL, and not more than 10 percent of the samples shall exceed 230 per 100 mL."

The Ocean Plan does not specify a timeframe for the calculation of exceedances of the SHELL Objective. However, State Water Resources Control Board staff recommend the use of a 30-day rolling window to calculate exceedances of the SHELL Objective in ocean waters (J. Kaplan, personal communication, September 7, 2022).

3. Methods

3.1. Sample Collection

3.1.1. Ocean Beaches Monitoring Study

The Ocean Beaches Monitoring Study data evaluated in this report are from sampling conducted by the Regional Water Board as part of the Coastal Pathogens Project. Sample collection was performed according to the monitoring plan and standard operating procedures (SOP) described in the Quality Assurance Project Plan (QAPP) developed for the Coastal Pathogen Project (North Coast Regional Water Quality Control Board, 2015). Grab water samples were collected from 11 sampling stations (Figure 2). Most of the samples were collected in July, August, September, and October of 2017, however one sample was collected in December 2017 and one in January 2018. No replicate samples were collected. Precipitation status was not noted during, or prior to, sample collection. However, Regional Water Board staff have retrospectively determined the precipitation status for all samples collected at the 11 ocean beaches to be “dry”. Regional Water Board staff used the precipitation data provided by the California Department of Water Resources (CDWR) California Data Exchange Center to make the precipitation status determination (California Department of Water Resources, 2023a). Specifically, by using the historic daily incremental precipitation data available for a gauging station in the river basin and hydrologic area corresponding to each ocean beach sampling station. The Coastal Pathogens Project definition of dry and wet weather periods was then used to determine precipitation status for each sample collection date for each ocean beach sampling location. Specifically, a “dry” weather sample is defined as a sample “collected after 72 hours of dry weather”, and a wet weather sample is defined as a sample collected “during, or following, storm events that were predicted to generate 0.2 inches or greater of rainfall” (North Coast Regional Water Quality Control Board, 2015). For the six Humboldt County ocean beach sampling stations the ERK gauging station was used to determine precipitation status, and for the five Mendocino County ocean beach sampling stations the South Fork Eel River at Leggett (LEG) gauging station was used to determine precipitation status (California Department of Water Resources, 2023b).

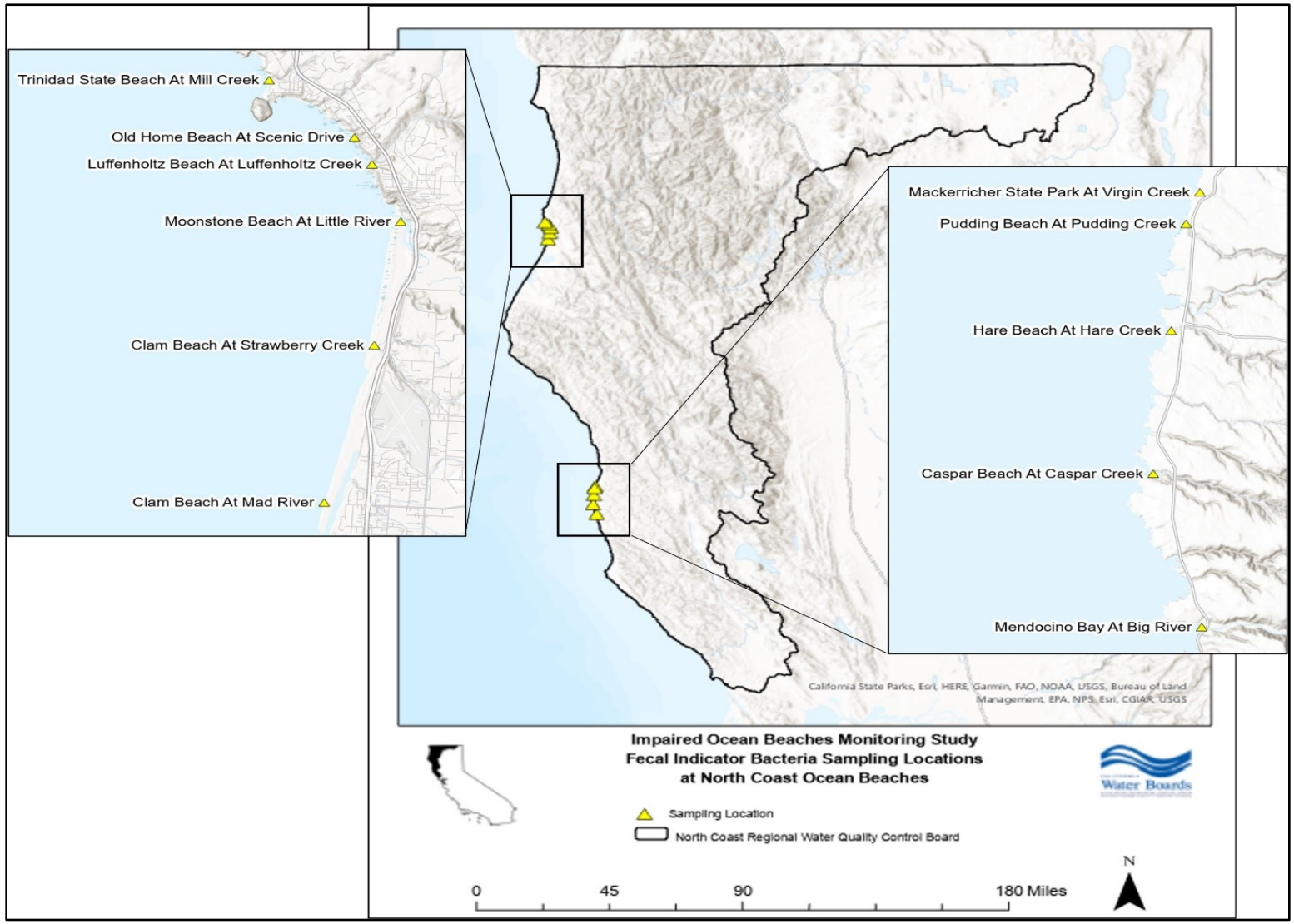

Figure 2 Sampling Stations of the Impaired Ocean Beaches Monitoring Study

3.1.2. BeachWatch Program Dataset

The BeachWatch dataset evaluated in this report includes data collected by Humboldt, Mendocino and Sonoma County health departments as required by Assembly Bill 411 (AB411). AB411 requires the testing of "waters adjacent to all public beaches, as defined, for total coliform, fecal coliform, and enterococci bacteria on a weekly basis from April 1 to October 31, inclusive, of each year" (*Assembly Bill No. 411*, 1997).

The BeachWatch FIB data assessed in this technical report were obtained from grab water samples collected from 18 ocean beach sampling stations from May 2015 through May 2022 (Figure 3). Ten ocean beaches that were sampled as part of the Ocean Beaches Monitoring Study of the Coastal Pathogens Project, were also sampled as part of BeachWatch. Namely, Big River Beach at Mendocino Bay, Caspar Headlands State Beach, Clam Beach (near Strawberry Creek), Clam Beach (near Mad River mouth), Hare Creek Beach, Luffenholtz Beach, MacKerricher State Park (near Virgin Creek), Moonstone County Park, Pudding Creek Beach, and Trinidad State Beach.

Most of the samples were collected during the months of April, May, June, July, August, September and October, however seven samples were collected in November in the years 2015, 2016, 2017 and 2021. FIB data, and associated metadata, for the samples collected as part of the BeachWatch monitoring program were obtained from the California Environmental Data Exchange Network (CEDEN) (State Water Resources Control Board, 2023). CEDEN requires the submittal of quality assurance data when submitting water quality data to the CEDEN portal. Quality assurance information submitted by the BeachWatch monitoring program for all samples assessed in this technical report can be found on the CEDEN website (https://ceden.waterboards.ca.gov/) (State Water Resources Control Board, 2023). Replicate samples were collected at twelve sampling stations. For locations where replicate samples were collected only the first replicate was included in the data analysis. Precipitation status was not noted during, or prior to, sample collection. Regional Water Board staff chose not to retroactively determine the precipitation status for the sampling dates for any of the 18 BeachWatch program sampling stations using the process described above in Section 3.1.1 because 1) of the sheer number of samples for which precipitation status would have to retroactively be determined, 2) sample precipitation status is not required for the calculation of REC-1 or SHELL Objective exceedances, and 3) since samples were collected between April 1 and October 31, it is highly likely that the precipitation status for an overwhelmingly large majority of samples is going to be "dry", therefore a seasonal, or "wet" versus "dry" comparison of enterococci or total coliform data is unlikely to result in any meaningful insights.

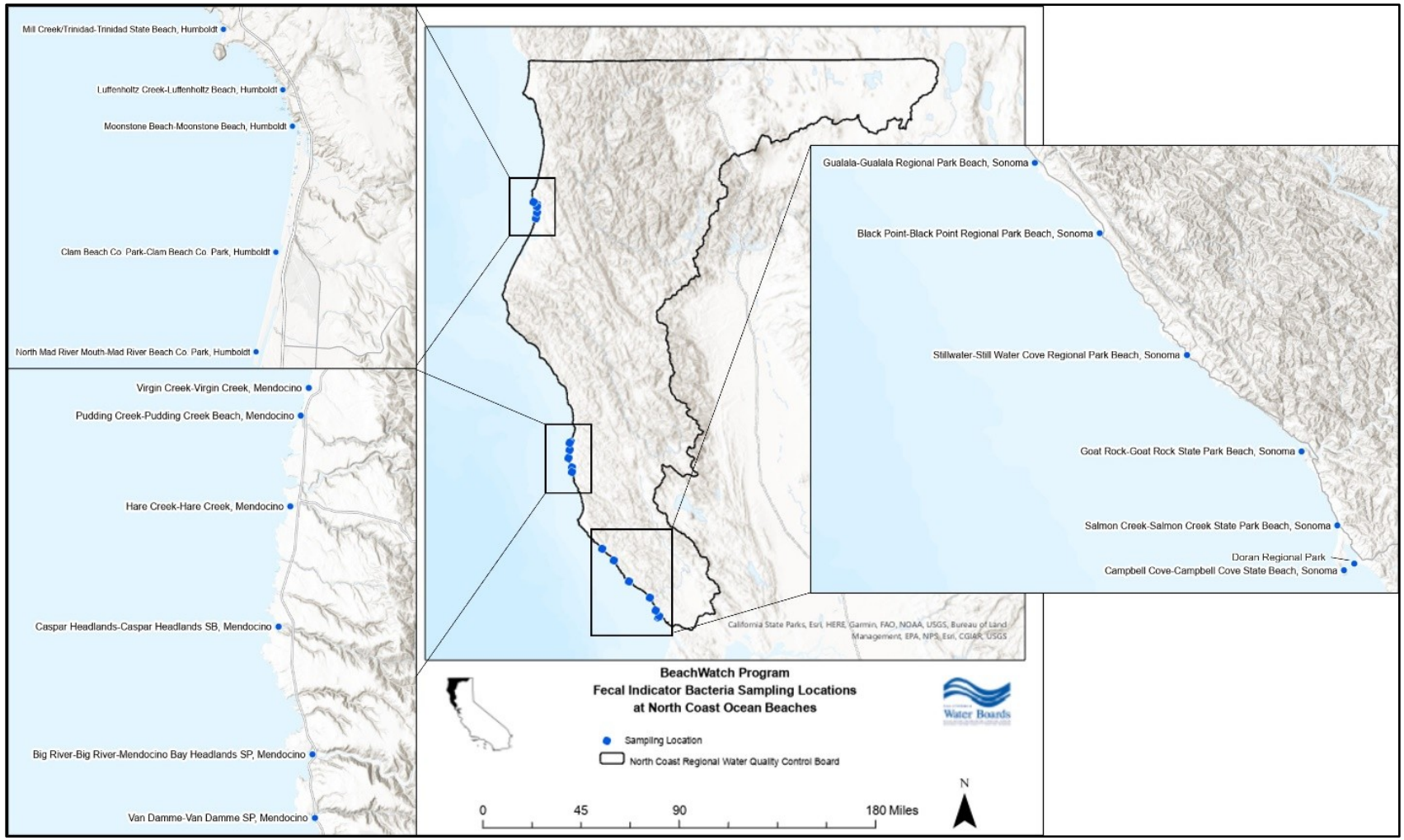

Figure 3 Sampling Stations of the BeachWatch Program Dataset

3.2. Laboratory Analysis of FIB Samples

3.2.1. Ocean Beach Monitoring Study

Tables 2, 3, and 4 below describe the laboratory details for the detection and enumeration of enterococci and total coliform for water samples collected as part of the Impaired Ocean Beaches Monitoring Study. Table 2 lists the details of the samples collected from the two Humboldt County Ocean Beaches that were analyzed for the detection and enumeration of enterococci. Tables 3 and 4 list the details for the samples collected from Humboldt, and Mendocino County ocean beaches, respectively, that were analyzed for the detection and enumeration of total coliform. Only two beaches were selected for enterococci assessment, whereas samples collected from all 11 beaches were analyzed for the detection and enumeration of total coliform.

Samples were analyzed according to the standard operating procedures described in the QAPP for the Coastal Pathogen Project (North Coast Regional Water Quality Control Board, 2015).

Table 2 Laboratory Analysis Details of the Ocean Beaches Monitoring Study for the Detection and Enumeration of Enterococci (Humboldt County)

Sampling station Name and Code[a,b]	Number of Samples Analyzed	Analysis Method[c,d]
Clam Beach at Strawberry Creek (109SW0001 or 108SC0550)[e]	3	Enterolert test
Old Home Beach at Scenic Drive (108HBOHB1)	18	Enterolert test

[a]The sampling station code has been developed according to the Surface Water Ambient Monitoring Program (SWAMP) naming convention for sampling stations. SWAMP requires a numeric 3-digit code for the hydrologic unit of the ocean beach being sampled followed by a random 6-digit code, which consists of a 2-letter code for the stream name, and a random 4-digit code.
[b]Enterococci data were collected from only two of the 11 stations during the Ocean Beaches Monitoring Study.
[c]All samples were analyzed by the Humboldt County Public Health Laboratory
[d]Enterolert test - USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)
[e]Two different sampling station codes were assigned to the same sampling station.

Table 3 Laboratory Analysis Details of the Ocean Beaches Monitoring Study for the Detection and Enumeration of Total Coliform (Humboldt County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c,d]
Clam Beach at Mad River (109MA0001)	18	Multiple Tube Fermentation

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c,d]
Clam Beach at Strawberry Creek (109SW0001 or 108SC0550)[e]	18	Multiple Tube Fermentation
Luffenholtz Beach at Luffenholtz Creek (108LF0001)	18	Multiple Tube Fermentation
Moonstone Beach at Little River (108LR0001)	18	Multiple Tube Fermentation
Old Home Beach at Scenic Drive (108HBOHB1)	16	Multiple Tube Fermentation
Trinidad State Beach at Mill Creek (108ML0001)	18	Multiple Tube Fermentation

[a]The sampling station code has been developed according to the Surface Water Ambient Monitoring Program (SWAMP) naming convention for sampling stations. SWAMP requires a numeric 3-digit code for the hydrologic unit of the ocean beach being sampled followed by a random 6-digit code, which consists of a 2-letter code for the stream name, and a random 4-digit code.
[b]All samples were analyzed by the Humboldt County Public Health Laboratory.
[c]Colilert test - USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)
[d]Multiple Tube Fermentation - USEPA Standard Method 9221 (Standard Methods, 2016)
[e]Two different sampling station codes were assigned to the same sampling station.

Table 4 Laboratory Analysis Details of the Ocean Beaches Monitoring Study for the Detection and Enumeration of Total Coliform (Mendocino County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c,d]
Caspar Beach at Caspar Creek (113CA0001)	13	Colilert Test
Hare Beach at Hare Creek (113HC0001)	13	Colilert Test
MacKerricher State Park at Virgin Creek (113VR0001)	4	Colilert Test
Mendocino Bay at Big River (113BI0001)	13	Colilert Test
Pudding Beach at Pudding Creek (113PD0001)	13	Colilert Test

[a]The sampling station code has been developed according to the Surface Water Ambient Monitoring Program (SWAMP) naming convention for sampling stations. SWAMP requires a numeric 3-digit code for the hydrologic unit of the ocean beach being sampled followed by a

random 6-digit code, which consists of a 2-letter code for the stream name, and a random 4-digit code.
[b]All samples were analyzed by the Sonoma County Public Health Laboratory.
[c]Colilert test - USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)
[d]Multiple Tube Fermentation - USEPA Standard Method 9221 (Standard Methods, 2016)

3.2.2. BeachWatch Program Dataset

Tables 5, 6, and 7 below describe the laboratory details for the detection and enumeration of enterococci from samples collected from Humboldt, Mendocino, and Sonoma County ocean beaches, respectively for the BeachWatch Program. Tables 8, 9,and 10 below describe the laboratory details for the detection and enumeration of total coliform from samples collected from Humboldt, Mendocino, and Sonoma County ocean beaches, respectively for the BeachWatch Program. Quality assurance information for these samples can be found on the CEDEN website (https://ceden.waterboards.ca.gov/) (State Water Resources Control Board, 2023).

Table 5 Laboratory Analysis Details of the BeachWatch Program Dataset for the Detection and Enumeration of Enterococci (Humboldt County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c]
Clam Beach Co. Park-Clam Beach County Park, Humboldt (Clam Beach Co Park)	236	Enterolert Test
Luffenholtz Creek-Luffenholtz Beach, Humboldt (Luffenholtz Creek)	227	Enterolert Test
Mill Creek/Trinidad-Trinidad State Beach, Humboldt (Mill Creek/Trinidad)	219	Enterolert Test
Moonstone Beach-Moonstone Beach, Humboldt (Moonstone Beach)	217	Enterolert Test
North Mad River Mouth-Mad River Beach County Park, Humboldt (North Mad River Mouth)	194	Enterolert Test

[a]The sampling station naming system including the sampling station code was developed by the BeachWatch Program
[b]All samples were analyzed by the Humboldt County Public Health Laboratory.
[c]Enterolert test – USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)

Table 6 Laboratory Analysis Details of the BeachWatch Program Dataset for the Detection and Enumeration of Enterococci (Mendocino County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c]
Big River-Big River-Mendocino Bay Headlands State Park, Mendocino (Big River)	210	Enterolert Test
Caspar Headlands-Caspar Headlands State Beach, Mendocino (Caspar Headlands)	213	Enterolert Test
Hare Creek-Hare Creek, Mendocino (Hare Creek)	209	Enterolert Test
Pudding Creek-Pudding Creek Beach, Mendocino (Pudding Creek)	212	Enterolert Test
Van Damme-Van Damme State Park, Mendocino (Van Damme)	209	Enterolert Test
Virgin Creek-Virgin Creek, Mendocino (Virgin Creek)	119	Enterolert Test

[a]The sampling station naming system including the sampling station code was developed by the BeachWatch Program

[b]All samples were analyzed by the Sonoma County Public Health Laboratory.

[c]Enterolert test – USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)

Table 7 Laboratory Analysis Details of the BeachWatch Program Dataset for the Detection and Enumeration of Enterococci (Sonoma County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c]
Black Point-Black Point Regional Park Beach, Sonoma (Black Point)	203	Enterolert Test
Campbell Cove-Campbell Cove State Beach, Sonoma (Campbell Code)	205	Enterolert Test
Doran Park – Doran Regional Park Beach, Sonoma (Doran Park)	202	Enterolert Test
Goat Rock-Goat Rock State Park Beach, Sonoma (Goat Rock)	204	Enterolert Test

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c]
Gualala-Gualala Regional Park Beach, Sonoma (Gualala)	203	Enterolert Test
Salmon Creek-Salmon Creek State Park Beach, Sonoma (Salmon Creek)	206	Enterolert Test
Stillwater-Still Water Cove Regional Park Beach, Sonoma (Stillwater)	201	Enterolert Test

[a]The sampling station naming system including the sampling station code was developed by the BeachWatch Program
[b]All samples were analyzed by the Sonoma County Public Health Laboratory.
[c]Enterolert test – USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)

Table 8 Laboratory Analysis Details of the BeachWatch Program Dataset for the Detection and Enumeration of Total Coliform (Humboldt County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c]
Clam Beach Co. Park-Clam Beach County Park, Humboldt (Clam Beach Co Park)	266	Colilert Test
Luffenholtz Creek-Luffenholtz Beach, Humboldt (Luffenholtz Creek)	261	Colilert Test
Mill Creek/Trinidad-Trinidad State Beach, Humboldt (Mill Creek/Trinidad)	252	Colilert Test
Moonstone Beach-Moonstone Beach, Humboldt (Moonstone Beach)	252	Colilert Test
North Mad River Mouth-Mad River Beach County Park, Humboldt (North Mad River Mouth)	221	Colilert Test

[a]The sampling station naming system including the sampling station code was developed by the BeachWatch Program
[b]All samples were analyzed by the Humboldt County Public Health Laboratory.
[c]Colilert test – USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)

Table 9 Laboratory Analysis Details of the BeachWatch Program Dataset for the Detection and Enumeration of Total Coliform (Mendocino County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b]
Big River-Big River-Mendocino Bay Headlands State Park, Mendocino (Big River)	211	Colilert Test
Caspar Headlands-Caspar Headlands State Beach, Mendocino (Caspar Headlands)	214	Colilert Test
Hare Creek-Hare Creek, Mendocino (Hare Creek)	210	Colilert Test
Pudding Creek-Pudding Creek Beach, Mendocino (Pudding Creek)	212	Colilert Test
Van Damme-Van Damme State Park, Mendocino (Van Damme)	209	Colilert Test
Virgin Creek-Virgin Creek, Mendocino (Virgin Creek)	119	Colilert Test

[a]The sampling station naming system including the sampling station code was developed by the BeachWatch Program

[b]All samples were analyzed by the Sonoma County Public Health Laboratory.

[c]Colilert test – USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)

Table 10 Laboratory Analysis Details of the BeachWatch Program Dataset for the Detection and Enumeration of Total Coliform (Sonoma County)

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c]
Black Point-Black Point Regional Park Beach, Sonoma (Black Point)	203	Colilert Test
Campbell Cove-Campbell Cove State Beach, Sonoma (Campbell Cove)	208	Colilert Test
Doran Park-Doran Regional Park Beach, Sonoma (Doran Park)	203	Colilert Test
Goat Rock-Goat Rock State Park Beach, Sonoma (Goat Rock)	202	Colilert Test

Sampling station Name and Code[a]	Number of Samples Analyzed	Analysis Method[b,c]
Gualala-Gualala Regional Park Beach, Sonoma (Gualala)	204	Colilert Test
Salmon Creek-Salmon Creek State Park Beach, Sonoma (Salmon Creek)	205	Colilert Test
Stillwater-Still Water Cove Regional Park Beach, Sonoma (Stillwater)	201	Colilert Test

[a]The sampling station naming system including the sampling station code was developed by the BeachWatch Program
[b]All samples were analyzed by the Sonoma County Public Health Laboratory.
[c]Colilert test – USEPA Standard Method 9223B Enzyme Substrate Coliform Test (Standard Methods, 2016)

3.3. Data Analysis

FIB data for all samples of the Coastal Pathogens Project, including the Ocean Beaches Monitoring Study, are available in the CEDEN database (https://ceden.waterboards.ca.gov/) (State Water Resources Control Board, 2023), under the Project "Coastal Pathogen Project 2016-2018".

FIB data for the samples collected as part of the BeachWatch Program that are included for analysis in this technical report are also available in the CEDEN database (https://ceden.waterboards.ca.gov/) under the Projects "BeachWatch-Humboldt County", "BeachWatch-Mendocino County", and "BeachWatch-Sonoma County". Data were preprocessed and then analyzed to 1) compare enterococci data to the REC-1 Objective for ocean waters and total coliform data to the SHELL Objective for ocean waters, and 2) to provide enterococci and total coliform data summary statistics (number of samples assessed, minimum, median, and maximum concentrations). Data analysis was conducted using R version 4.2.2 (R Foundation for Statistical Computing, 2022).

3.3.1. Data Preprocessing

Before data analysis was conducted FIB data were preprocessed as described below.

For sampling stations where replicate samples were collected, only the first sample collected was included in the data analysis. Additionally, samples collected within 200 meters of each other are considered to reflect water quality from the same sampling station (State Water Resources Control Board, 2015) and are aggregated, even if they were collected by different programs.

Data aggregation details are provided in Tables 11,12, and 13 (enterococci for ocean beaches in Humboldt, Mendocino, and Sonoma Counties respectively) and Tables 14,

15, and 16 (total coliform for ocean beaches in Humboldt, Mendocino, and Sonoma Counties, respectively). If both BeachWatch Program and Impaired Ocean Beaches Monitoring Study data were available for the same ocean beach, the corresponding station names are listed with a "+" sign to indicate that data were aggregated from both sampling stations. If only BeachWatch Program or only Impaired Ocean Beaches Monitoring Study data are available for a particular ocean beach, then the corresponding station name is listed.

Table 11 Enterococci Data Assessment Details (Humboldt County)

Ocean Beach	Station Name
Clam Beach (near Strawberry Creek)	Clam Beach Co. Park-Clam Beach Co. Park, Humboldt[a] + Clam Beach at Strawberry Creek[b]
Clam Beach (near Mad River mouth)	North Mad River Mouth-Mad River Beach Co. Park, Humboldt[a]
Luffenholtz Beach	Luffenholtz Creek-Luffenholtz Beach, Humboldt[a]
Moonstone County Park	Moonstone Beach-Moonstone Beach, Humboldt[a]
Old Home Beach	Old Home Beach at Scenic Drive[b]
Trinidad State Beach	Mill Creek/Trinidad-Trinidad State Beach, Humboldt[a]

[a]BeachWatch Program sampling station
[b]Impaired Ocean Beaches Monitoring Study sampling station

Table 12 Enterococci Data Assessment Details (Mendocino County)

Ocean Beach	Station Name
Big River Beach at Mendocino Bay	Big River-Big River-Mendocino Bay Headlands SP, Mendocino[a]
Caspar Headlands State Beach	Caspar Headlands-Caspar Headlands SB, Mendocino[a]
Hare Creek Beach	Hare Creek-Hare Creek, Mendocino[a]
MacKerricher State Park (near Virgin Creek)	Virgin Creek-Virgin Creek, Mendocino[a]
Pudding Creek Beach	Pudding Creek-Pudding Creek Beach, Mendocino[a]
Van Damme State Park (beach area)	Van Damme-Van Damme SP, Mendocino[a]

[a]BeachWatch Program sampling station
[b]Impaired Ocean Beaches Monitoring Study sampling station

Table 13 Enterococci Data Assessment Details (Sonoma County)

Ocean Beach	Station Name
Black Point	Black Point-Black Point Regional Park Beach, Sonoma[a]
Campbell Cove	Campbell Cove-Campbell Cove State Beach, Sonoma[a]
Doran Regional Park	Doran Park-Doran Regional Park Beach, Sonoma[a]
Goat Rock State Park Beach	Goat Rock-Goat Rock State Park Beach, Sonoma[a]
Gualala Regional Park Beach	Gualala-Gualala Regional Park Beach, Sonoma[a]
Salmon Creek Park (South)	Salmon Creek-Salmon Creek State Park Beach, Sonoma[a]
Stillwater Cove Regional Park (beach area)	Stillwater-Still Water Cove Regional Park Beach, Sonoma[a]

[a]BeachWatch Program sampling station
[b]Impaired Ocean Beaches Monitoring Study sampling station

Table 14 Total Coliform Data Assessment Details (Humboldt County)

Ocean Beach	Station Name
Clam Beach (near Strawberry Creek)	Clam Beach Co. Park-Clam Beach Co. Park, Humboldt[a] + Clam Beach at Strawberry Creek[b]
Clam Beach (near Mad River mouth)	North Mad River Mouth-Mad River Beach Co. Park, Humboldt[a] + Clam Beach at Mad River[b]
Luffenholtz Beach	Luffenholtz Creek-Luffenholtz Beach, Humboldt[a] + Luffenholtz Beach at Luffenholtz Creek[b]
Moonstone County Park	Moonstone Beach-Moonstone Beach, Humboldt[a] + Moonstone Beach at Little River[b]
Old Home Beach	Old Home Beach at Scenic Drive[b]
Trinidad State Beach	Mill Creek/Trinidad-Trinidad State Beach, Humboldt[a] + Trinidad State Beach at Mill Creek[b]

[a]BeachWatch Program sampling station
[b]Impaired Ocean Beaches Monitoring Study sampling station

Table 15 Total Coliform Data Assessment Details (Mendocino County)

Ocean Beach	Station Name
Big River Beach at Mendocino Bay	Big River-Big River-Mendocino Bay Headlands SP, Mendocino[a] + Mendocino Bay at Big River[b]
Caspar Headlands State Beach	Caspar Headlands-Caspar Headlands SB, Mendocino[a] + Caspar Beach at Caspar Creek[b]
Hare Creek Beach	Hare Creek-Hare Creek, Mendocino[a] + Hare Beach at Hare Creek[b]
MacKerricher State Park (near Virgin Creek)	Virgin Creek-Virgin Creek, Mendocino[a] + MacKerricher State Park at Virgin Creekb
Pudding Creek Beach	Pudding Creek-Pudding Creek Beach, Mendocino[a] + Pudding Beach at Pudding Creek[b]
Van Damme State Park (beach area)	Van Damme-Van Damme SP, Mendocino[a]

[a]BeachWatch Program sampling station
[b]Impaired Ocean Beaches Monitoring Study sampling station

Table 16 Total Coliform Data Assessment Details (Sonoma County)

Ocean Beach	Station Name
Black Point	Black Point-Black Point Regional Park Beach, Sonoma[a]
Campbell Cove	Campbell Cove-Campbell Cove State Beach, Sonoma[a]
Doran Regional Park	Doran Park-Doran Regional Park Beach, Sonoma[a]
Goat Rock State Park Beach	Goat Rock-Goat Rock State Park Beach, Sonoma[a]
Gualala Regional Park Beach	Gualala-Gualala Regional Park Beach, Sonoma[a]
Salmon Creek Park (South)	Salmon Creek-Salmon Creek State Park Beach, Sonoma[a]
Stillwater Cove Regional Park (beach area)	Stillwater-Still Water Cove Regional Park Beach, Sonoma[a]

[a]BeachWatch Program sampling station
[b]Impaired Ocean Beaches Monitoring Study sampling station

The percentage of non-detects (samples with FIB analyte concentration below the lower method detection limit) in all samples analyzed for the detection and enumeration of enterococci and total coliform were 65.28% and 31.43% respectively. These samples were assigned the value of the lower method detection limit. The percentage of analyzed samples with enterococci and total coliform concentrations that were above the upper method detection limit sample were 0.05% and 0.32% respectively. These samples were assigned the value of the upper method detection limit.

3.3.2. Comparison of Enterococci Data to the REC-1 Objective for Ocean Waters

Enterococci data from all 19 beach sampling stations were assessed for exceedance of the REC-1 Objective in ocean waters as described in Table 1 in Section 2.1 of this report (State Water Resources Control Board, 2019b). In the Technical Report "Assessment of Fecal Indicator Bacteria Data from 24 Humboldt County Coastal Surface Streams" (North Coast Regional Water Quality Control Board, 2022) the REC-1 Objective for surface waters was evaluated during three assessment periods: during an assessment year (November 1 of Year 1 through October 31 of Year 2), during the winter assessment period (November 1 of Year 1 through March 31 of Year 2), and during the summer assessment period (April 1 of Year 1 through October 31 of Year 1). However, for this report, given that 99.78% of the ocean beach enterococci data were collected during the summer assessment period (April 1 through October 31), assessments will not be conducted for the winter and year-round timeframes. With only 0.22% of the data having been collected outside of the summer assessment period, specifically in November (2015, 2016, 2017, and 2021), these data cannot realistically be considered representative of year-round or winter conditions.

Geometric Means (GM) and Statistical Threshold Values (STV) were calculated, as per the REC-1 Objective, for each ocean beach during the summer assessment period. For each ocean beach, a total number of calculations and number of exceedances of the GM and STV criteria of the REC-1 Objective were determined. A detailed explanation of how GM and STVs are calculated for a water body and how exceedances of the GM and STV criteria of the REC-1 Objective are subsequently determined is provided in Sections 2.3.2.1 and 2.3.2.2 of the technical report entitled "Assessment of Fecal Indicator Bacteria Data from 24 Humboldt County Coastal Surface Streams" (North Coast Regional Water Quality Control Board, 2022).

To evaluate exceedances of the REC-1 Objective each ocean beach was assessed in accordance with the binomial tables provided in the Listing Policy to determine if the exceedance frequency of the GM or STV criteria was equal to or greater than the minimum allowed exceedance frequency. (State Water Resources Control Board, 2015).

3.3.3. Comparison of Total Coliform Data to the SHELL Objective for Ocean Waters

Total coliform data from all 19 beach sampling stations were assessed for exceedance of the SHELL Objective in ocean waters as described in Section 2.2 of this report (State Water Resources Control Board, 2019b). Exceedances of the SHELL Objective are not conducted by assessment period, therefore all available total coliform data, irrespective of when the samples were collected, were included in the analysis. Of the total samples collected 99.82% were collected between April 1 and October 31 and 0.17% were collected outside that timeframe (November [2015, 2016, 2017 and 2021]).

Median total coliform values and 10% of total coliform data were calculated, as per the SHELL Objective, for each ocean beach by 30-day rolling windows (a 30-day timeframe that moves ahead in one-day intervals) (J. Kaplan, personal communication, October 2022, State Water Resources Control Board, 2015).

Since samples were not collected every day, but typically once a week (BeachWatch Program) or sporadically (Coastal Pathogens Program), the timeframe was "padded" to generate complete 30-day windows. The days added to the dataset can be considered as “blanks”, i.e. they have no data associated with them and they are simply added to generate a complete 30-day window in which to perform the required calculations. For example, if total coliform data were collected from a particular ocean beach on June 2, June 9, June 16, June 23, and June 30, blanks were added between these sampling days to generate a complete 30-day window. This process was repeated so that 30-day windows were generated for the entire total coliform dataset per ocean beach sampled. For each ocean beach, the total number of 30-day windows were tallied to provide the total number of calculations (Number of Calculations) for that ocean beach.

Median and 10% of data calculations were performed per 30-day rolling window and the exceedances (Number of Exceedances) of the median and 10% criterion thresholds of the SHELL Objective were calculated in the following manner:

Median criterion: If the median total coliform data calculated for each 30-day rolling window was greater than the 70 colony forming unit (cfu)/100 mL threshold listed in the Objective criterion (Section 2.2) then it was counted as an exceedance for that 30-day rolling window. This process was repeated for each 30-day rolling window and the total number of exceedances of the median criterion of the Objective were tallied to provide the total number of exceedances (Number of Exceedances) of the median criterion for a particular ocean beach.

10% criterion: If 10% of the total coliform data in a given 30-day rolling window were greater than the 230 cfu/100 mL threshold listed in the Objective criterion (Section 2.2) then it was counted as an exceedance for that 30-day rolling window. This process was repeated for each 30-day rolling window and the total number of exceedances of the 10% criterion of the Objective were tallied to provide the total number of exceedances (Number of Exceedances) of the 10% criterion for a particular ocean beach.

To evaluate exceedances of the SHELL Objective each ocean beach was assessed in accordance with the binomial tables provided in the Listing Policy to determine if the exceedance frequency of the Median or 10% criteria was equal to or greater than the minimum allowed exceedance frequency. (State Water Resources Control Board, 2015).

3.3.4. Calculation of Enterococci and Total Coliform Concentration Summary Statistics

Enterococci and total coliform data were summarized to provide the number of samples assessed, as well as the minimum, median, and maximum concentrations detected at all 19 ocean beaches. For enterococci summary calculations only, data collected between April 1 through October 31 were included, whereas for total coliform summary calculations all available data were included for the reasons described in sections 3.3.2 and 3.3.3. Due to the lack of precipitation data, ocean beach samples collected as part of the BeachWatch program cannot be classified as “dry weather” samples (collected after 72 hours of dry weather) or “wet weather” samples (collected during, or following, storm events predicted to generate 0.2 inches, or greater, of rainfall). Therefore, data summaries were provided for all available data and could not be stratified by precipitation status. In addition, the lack of auxiliary data and precipitation status, and significant differences in sample size across the various ocean beaches prevent Regional Water Board staff from providing an explanatory assessment, trends, or comparisons of the FIB data collected from the various ocean beaches analyzed.

4. Results

4.1. Comparison of Enterococci Data to the REC-1 Objective for Ocean Waters – Assessment Findings

Enterococci data for all 19 ocean beaches were compared to the REC-1 Objective for ocean waters for the summer assessment period as described in Section 3.3.2. Tables 17, 18, and 19 below list each ocean beach assessed, its current (2020/2022 Section 303(d) List) REC-1 beneficial use supporting status, and the number of exceedances per number of calculations of the GM and STV criteria of the REC-1 Objective for ocean beaches in Humboldt, Mendocino, and Sonoma County ocean beaches, respectively.

Figure 4 illustrates the exceedance of the Geometric Mean threshold of the REC-1 Objective, and Figure 5 illustrates the exceedance of the STV threshold of the REC-1 Objective, by Humboldt County Beaches.

Figure 6 illustrates the exceedance of the Geometric Mean threshold of the REC-1 Objective, and Figure 7 illustrates the exceedance of the STV threshold of the REC-1 Objective, by Mendocino County Beaches.

Figure 8 illustrates the exceedance of the Geometric Mean threshold of the REC-1 Objective, and Figure 9 illustrates the exceedance of the STV threshold of the REC-1 Objective by Sonoma County Beaches.

Table 17 Comparison of Enterococci Data to the REC-1 Objective for Ocean Waters (Humboldt County)

Ocean Beach	Status on the 2020/2022 Section 303(d) List	Number of Exceedances/Number of Calculations
		Summer Assessment Period
Clam Beach (near Mad River Mouth)	REC-1 Use Supported	GM: 6/158 STV: 3/44
Clam Beach (near Strawberry Creek)	REC-1 Use Not Supported	GM: 129/159 STV: 21/44
Luffenholtz Beach	REC-1 Use Not Supported	GM: 103/160 STV: 19/44
Moonstone County Park	REC-1 Use Supported	GM: 32/161 STV: 11/44
Old Home Beach	REC-1 Use Supported	GM: 4/14 STV: 2/4
Trinidad State Beach	REC-1 Use Not Supported	GM: 50/159 STV: 19/44

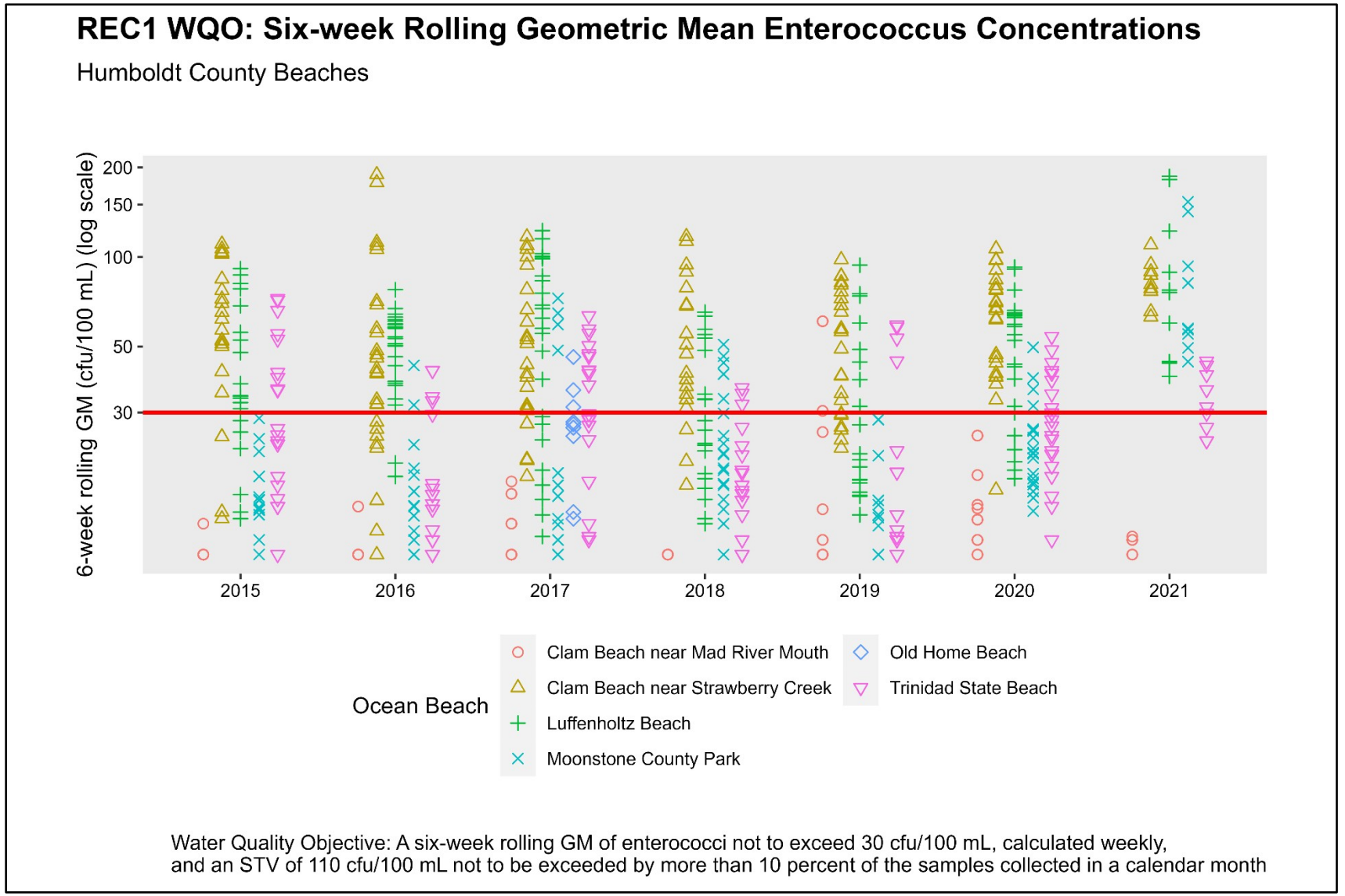

Figure 4 Exceedance of Geometric Mean Threshold of the REC-1 Objective by Humboldt County Beaches

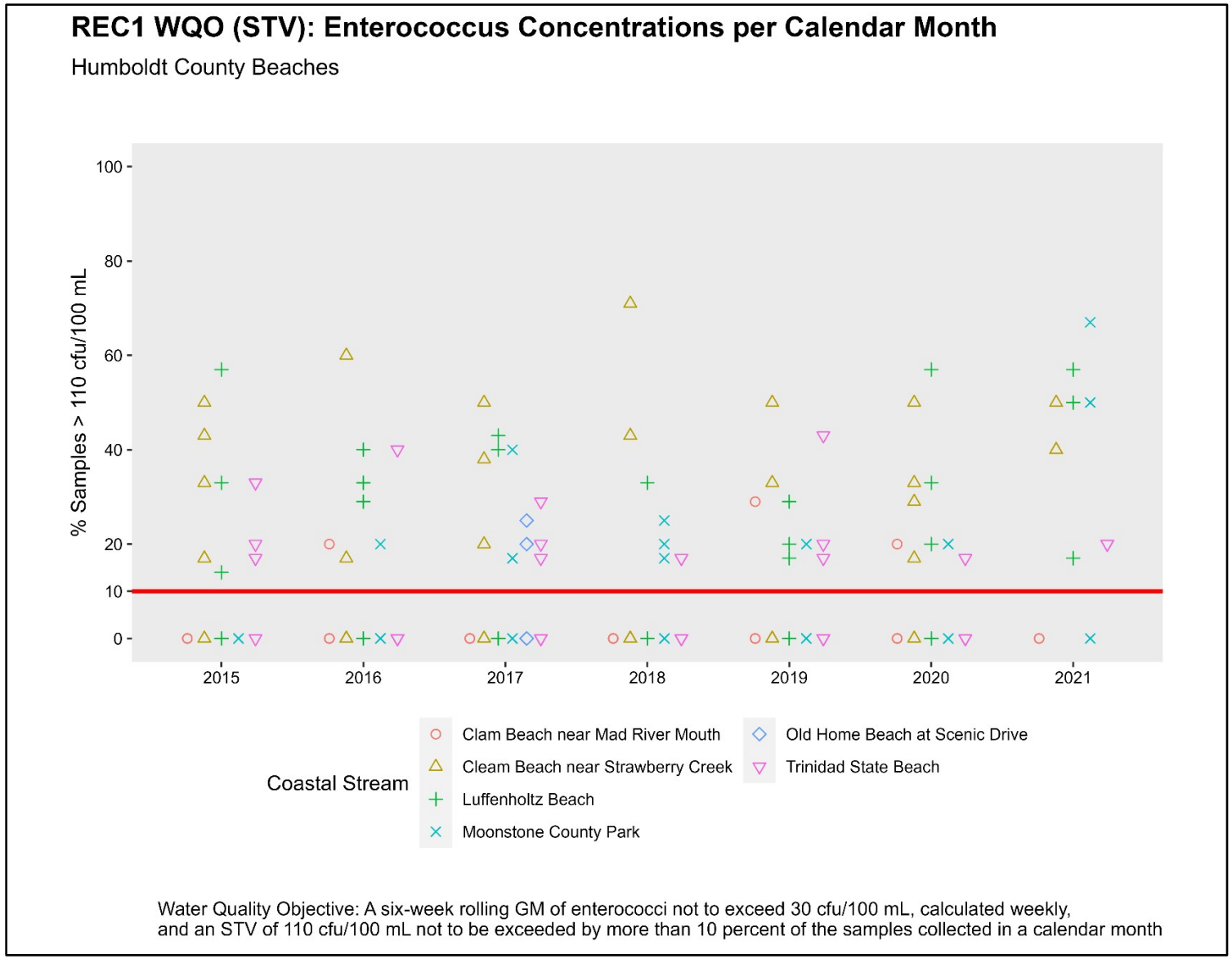

Figure 5 Exceedance of STV Threshold of the REC-1 Objective by Humboldt County Beaches

Table 18 Comparison of Enterococci Data to the REC-1 Objective for Ocean Waters (Mendocino County)

Ocean Beach	Status on the 2020/2022 Section 303(d) List	Number of Exceedances/Number of Calculations
		Summer Assessment Period
Big River Beach at Mendocino Bay	REC-1 Use Supported	GM: 0/181 STV: 1/50
Caspar Headlands State Beach	REC-1 Use Supported	GM: 0/181 STV: 1/50
Hare Creek Beach	REC-1 Use Supported	GM: 16/178 STV: 7/50
MacKerricher State Park (near Virgin Creek)	REC-1 Use Supported	GM: 0/89 STV: 0/33
Pudding Creek Beach	REC-1 Use Supported	GM: 8/182 STV: 5/50
Van Damme State Park (beach area)	REC-1 Use Supported	GM: 3/181 STV: 2/50

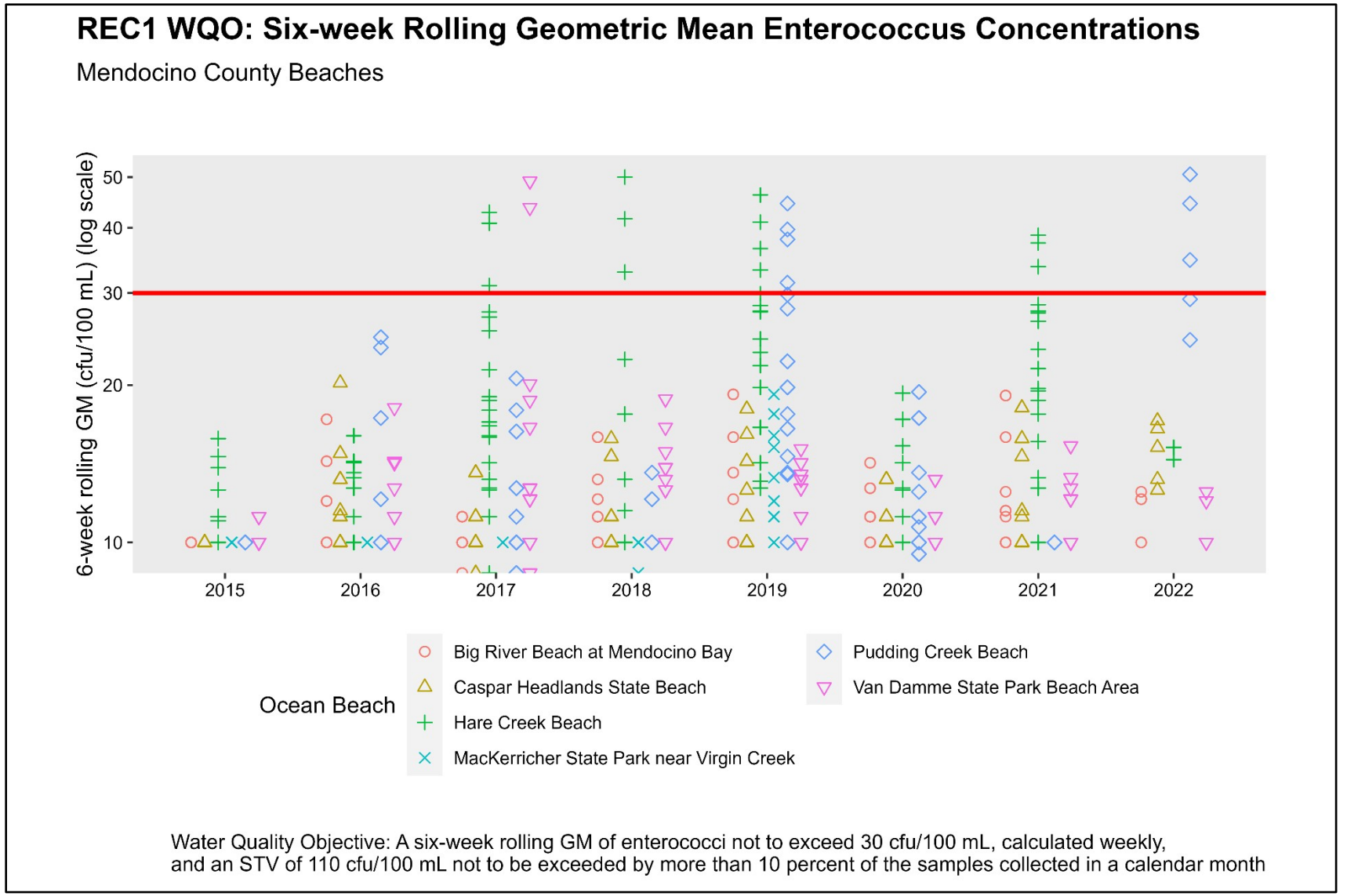

Figure 6 Exceedance of Geometric Mean Threshold of the REC-1 Objective by Mendocino County Beaches

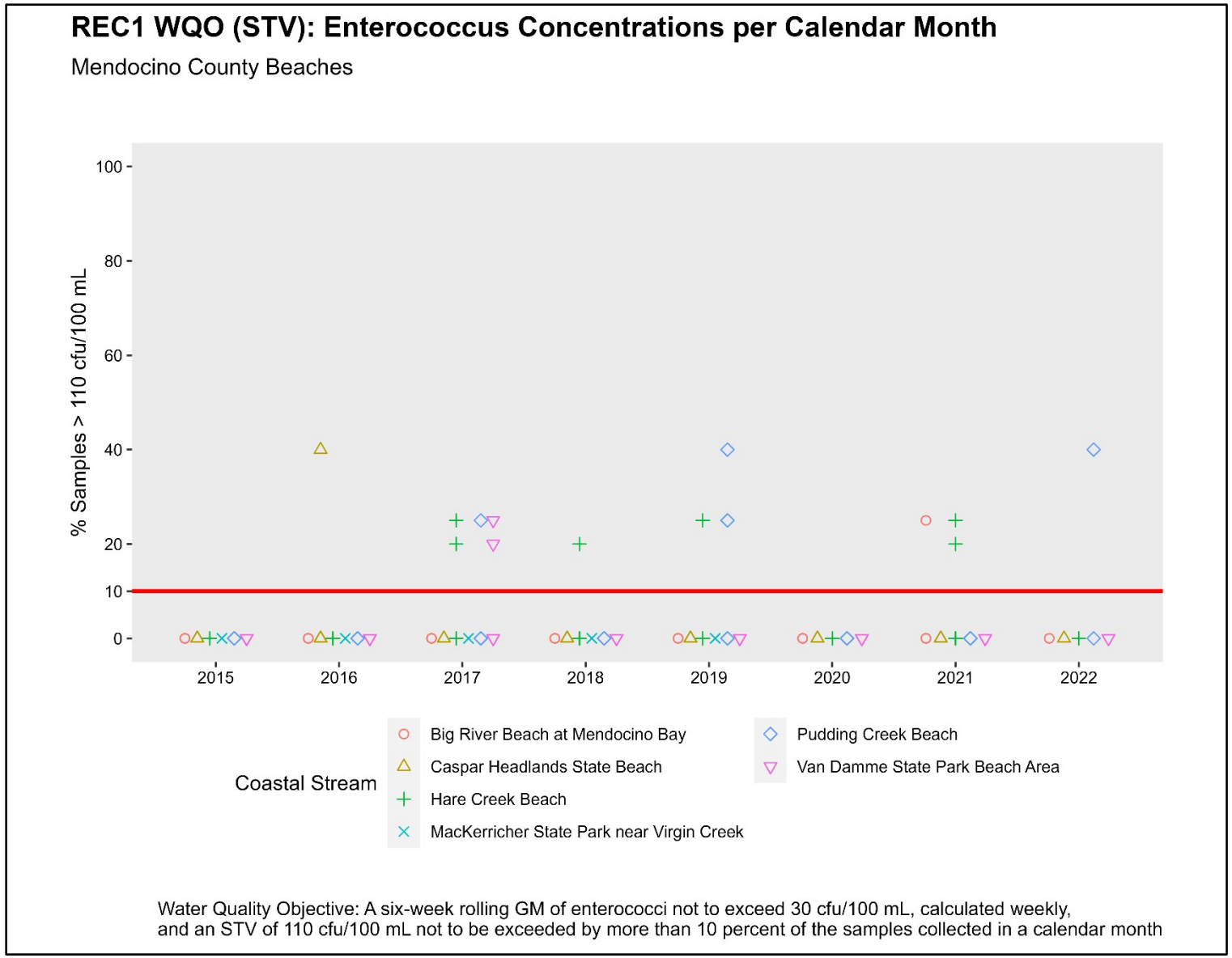

Figure 7 Exceedance of the STV Threshold of the REC-1 Objective by Mendocino County Beache

Table 19 Comparison of Enterococci Data to the REC-1 Objective for Ocean Waters (Sonoma County)

Ocean Beach	Status on the 2020/2022 Section 303(d) List	Number of Exceedances/Number of Calculations
		Summer Assessment Period
Black Point	REC-1 Use Supported	GM: 0/174 STV: 0/49
Campbell Cove	REC-1 Use Not Supported	GM: 10/170 STV: 7/49
Doran Regional Park	REC-1 Use Supported	GM: 4/169 STV: 1/49
Goat Rock State Park Beach	REC-1 Use Supported	GM: 0/168 STV: 2/49
Gualala Regional Park Beach	REC-1 Use Supported	GM: 0/174 STV: 0/49
Salmon Creek Park (South)	REC-1 Use Supported	GM: 0/174 STV: 0/49
Stillwater Cove Regional Park Beach	REC-1 Use Supported	GM: 0/168 STV: 0/49

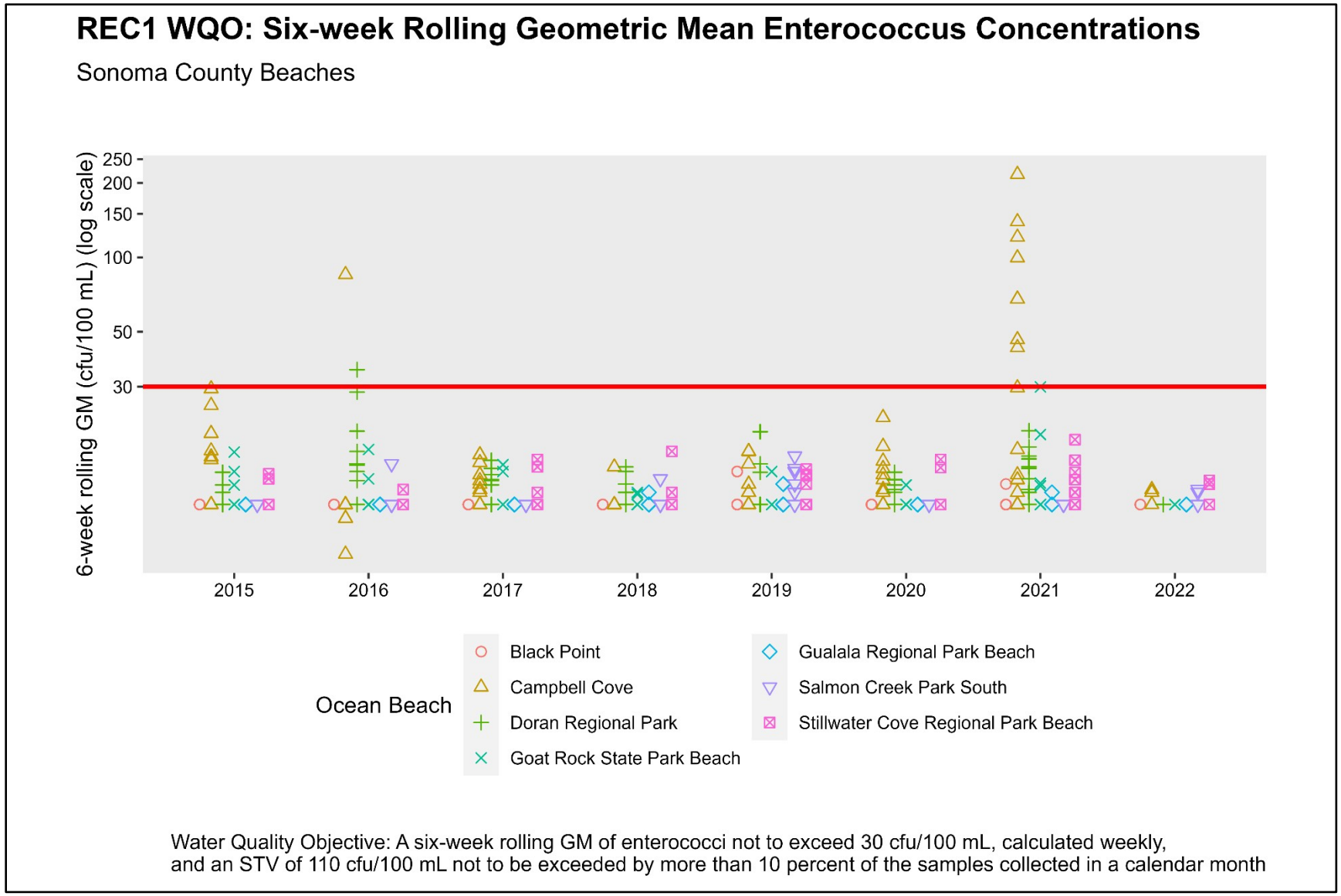

Figure 8 Exceedance of Geometric Mean Threshold of the REC-1 Objective by Sonoma County Beaches

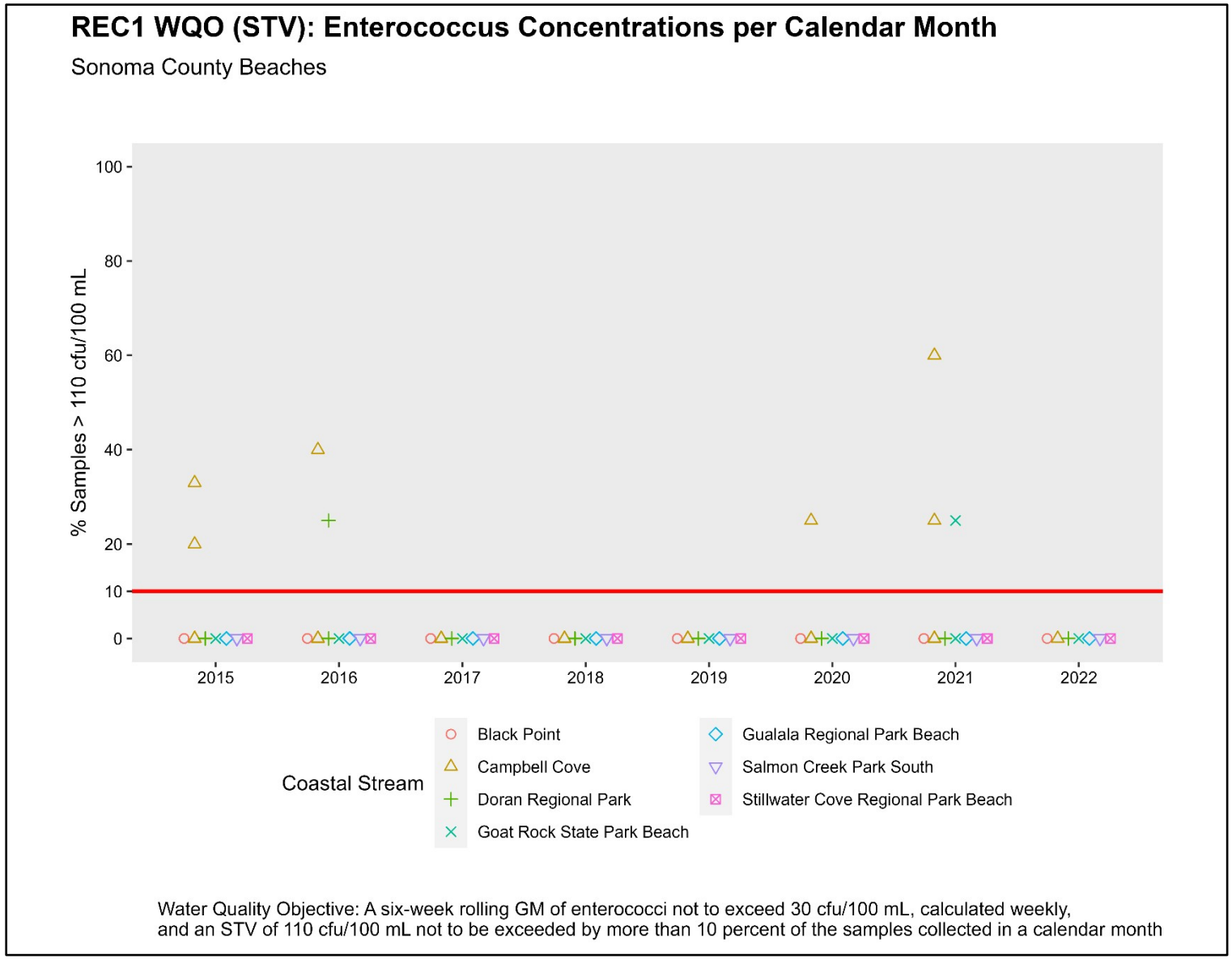

Figure 9 Exceedance of the STV Threshold of the REC-1 Objective by Sonoma County Beaches

4.2. Comparison of total coliform data to the SHELL Objective for Ocean Waters – Assessment Findings

Total coliform data for all 19 ocean beaches were compared to the SHELL Objective for ocean waters for the summer assessment period as described in Section 3.3.3. Tables 20, 21, and 22 below lists each ocean beach assessed, its current (2020/2022 Section 303(d) List) SHELL beneficial use supporting status, and the number of exceedances per number of calculations of the Median and 10% criteria of the SHELL Objective for Humboldt, Mendocino, and Sonoma County ocean beaches, respectively.

Figure 10 illustrates the exceedance of the Median threshold of the SHELL Objective, and Figure 11 illustrates the exceedance of the 10% threshold of the SHELL Objective, by Humboldt County Beaches.

Figure 12 illustrates the exceedance of the Median threshold of the SHELL Objective, and Figure 13 illustrates the exceedance of the 10% threshold of the SHELL Objective, by Mendocino County Beaches.

Figure 14 illustrates the exceedance of the Median threshold of the SHELL Objective, and Figure 15 illustrates the exceedance of the 10% threshold of the SHELL Objective by Sonoma County Beaches.

Table 20 Comparison of Enterococci Data to the SHELL Objective for Ocean Waters (Humboldt County)

Ocean Beach	Status on the 2020/2022 Section 303(d) List	Number of Exceedances/Number of Calculations
Clam Beach (near Mad River Mouth)	SHELL Use Not Supported	Median: 730/7170 10%: 1109/7170
Clam Beach (near Strawberry Creek)	SHELL Use Not Supported	Median: 1697/8520 10%: 1649/8520
Luffenholtz Beach	SHELL Use Not Supported	Median: 1696/8370 10%: 1689/8370
Moonstone County Park	SHELL Use Not Supported	Median: 1537/8100 10%: 1638/8100
Old Home Beach	SHELL Use Not Supported	Median: 149/480 10%: 129/480
Trinidad State Beach	SHELL Use Not Supported	Median: 1515/8100 10%: 1464/8100

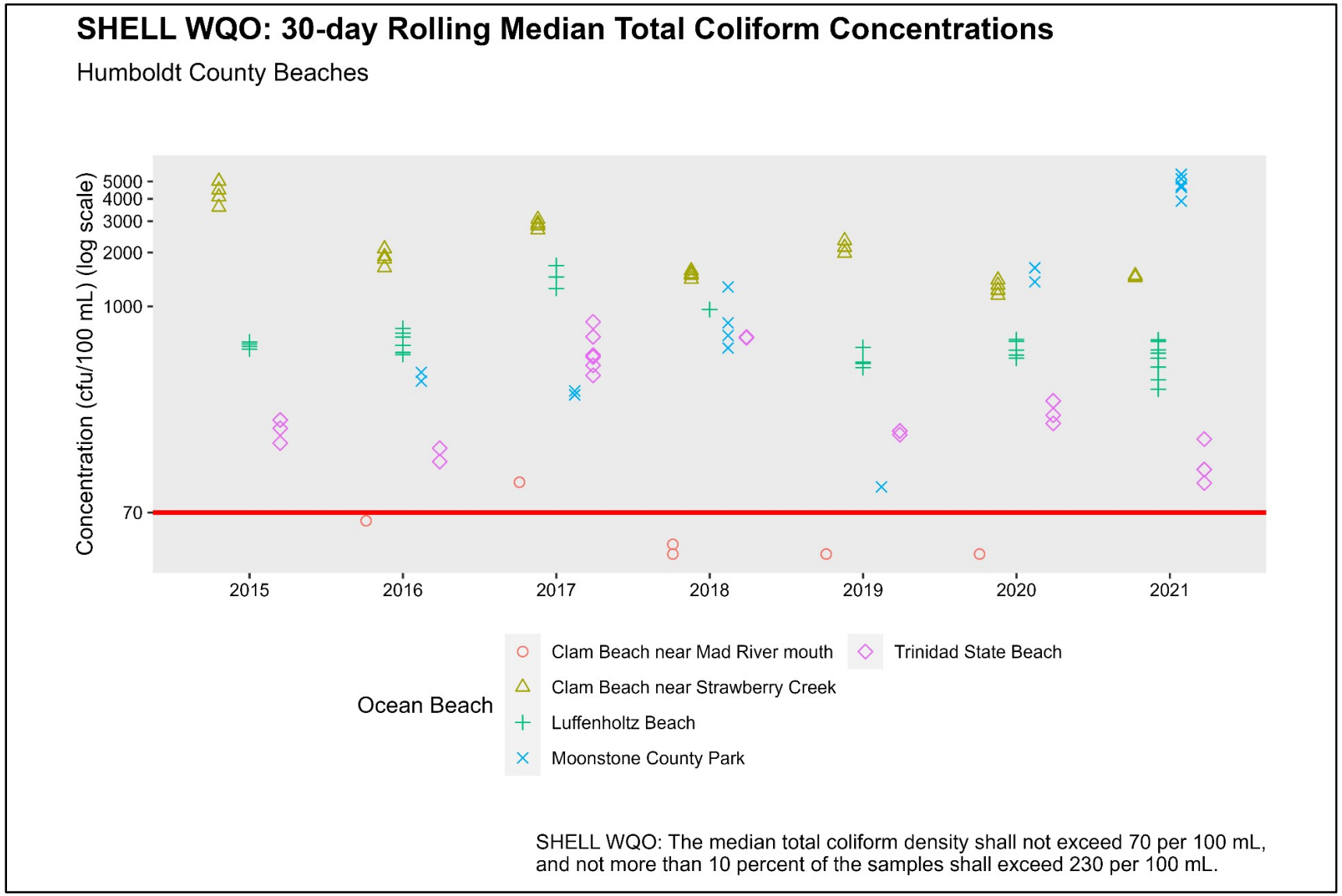

Figure 10 Exceedance of the Median Threshold of the SHELL Objective by Humboldt County Beaches

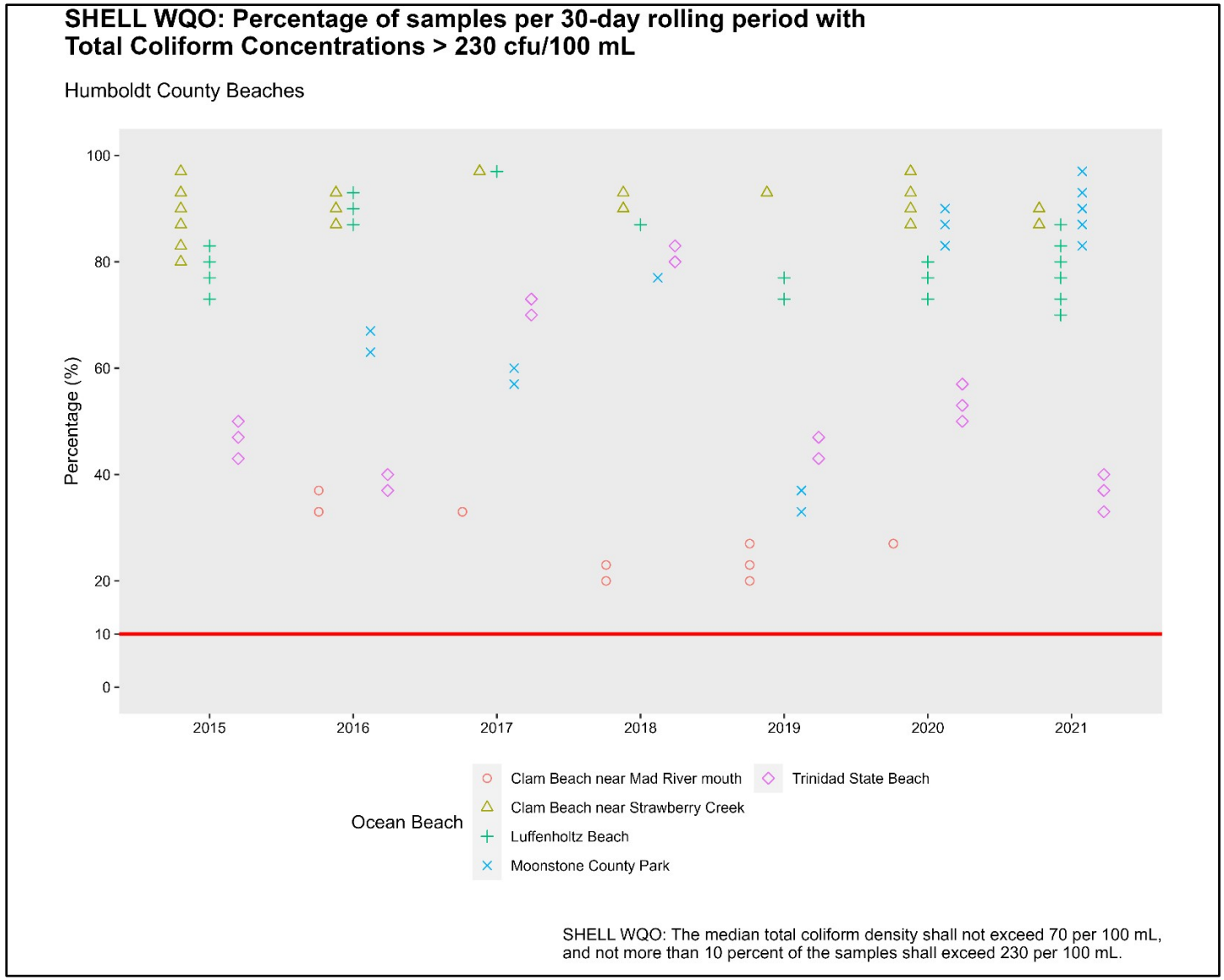

Figure 11 Exceedance of the 10% Threshold of the SHELL Objective by Humboldt County Beaches

Table 21 Comparison of Enterococci Data to the SHELL Objective for Ocean Waters (Mendocino County)

Ocean Beach	Status on the 2020/2022 Section 303(d) List	Number of Exceedances/Number of Calculations
Big River Beach at Mendocino Bay	SHELL Use Not Supported	Median: 235/6720 10%: 425/6720
Caspar Headlands State Beach	SHELL Use Not Supported	Median: 830/6810 10%: 782/6810
Hare Creek Beach	SHELL Use Not Supported	Median: 1118/6690 10%: 1107/6690
MacKerricher State Park (near Virgin Creek)	SHELL Use Not Supported	Median: 332/3690 10%: 317/3690
Pudding Creek Beach	SHELL Use Not Supported	Median: 471/6750 10%: 800/6750
Van Damme State Park (beach area)	SHELL Use Not Supported	Median: 72/6270 10%: 270/6270

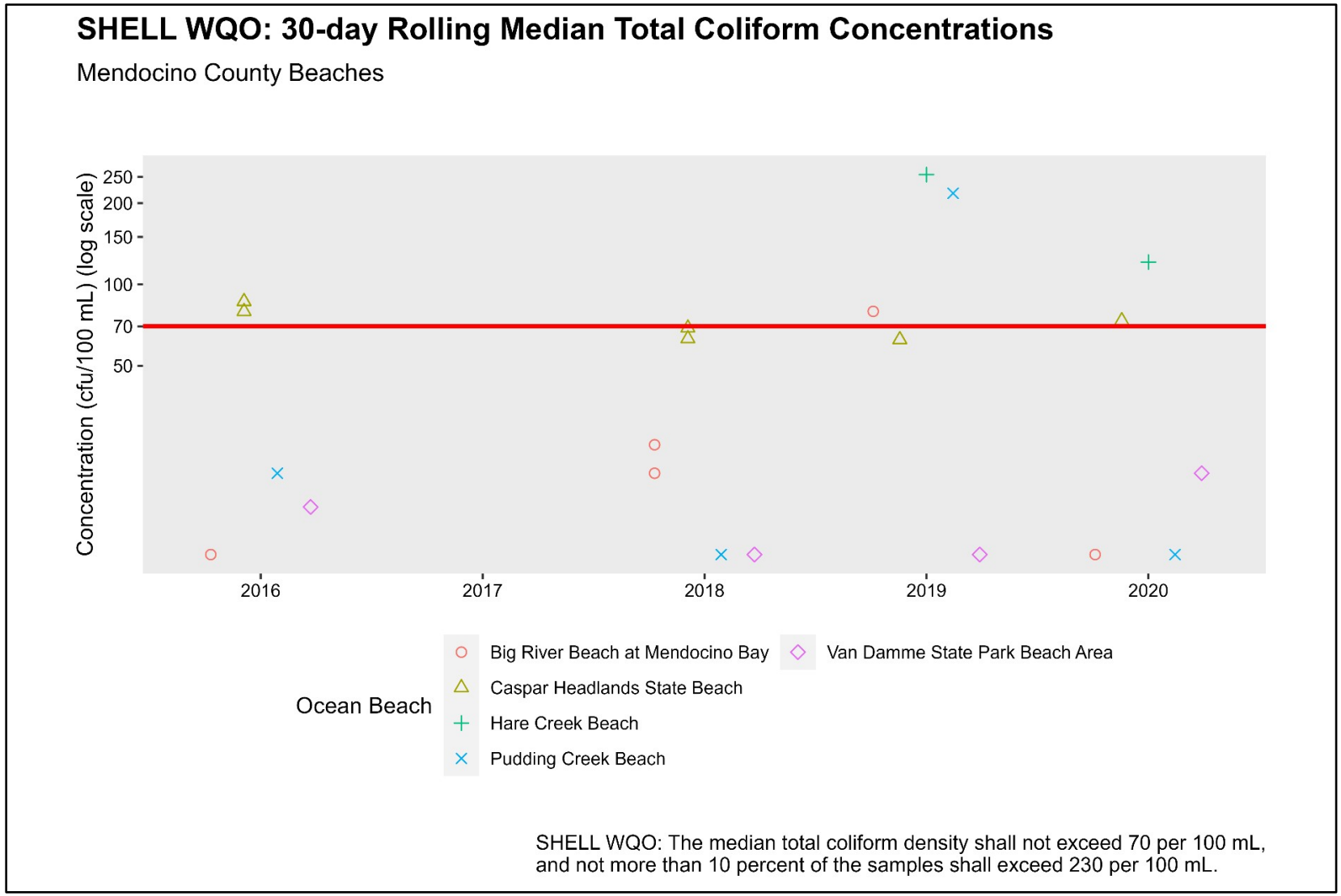

Figure 12 Exceedance of the Median Threshold of the SHELL Objective by Mendocino County Beaches

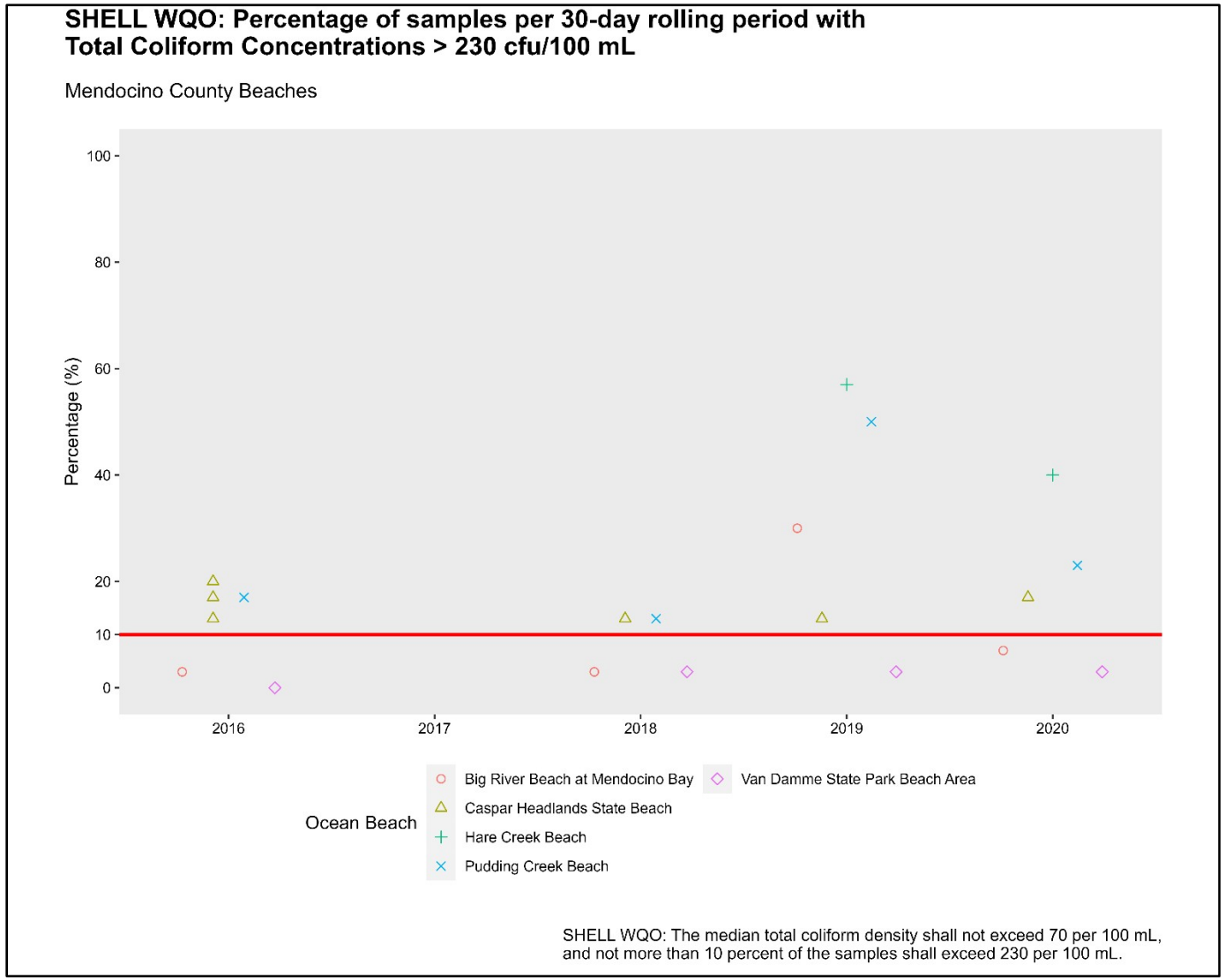

Figure 13 Exceedance of the 10% Threshold of the SHELL Objective by Mendocino County Beaches

Table 22 Comparison of Enterococci Data to the SHELL Objective for Ocean Waters (Sonoma County)

Ocean Beach	Status on the 2020/2022 Section 303(d) List	Number of Exceedances/Number of Calculations
Black Point	SHELL Use Supported	Median: 17/6090 10%: 30/6090
Campbell Cove	SHELL Use Not Supported	Median: 171/6240 10%: 321/6240
Doran Regional Park	SHELL Use Supported	Median: 67/6090 10%: 60/6090
Goat Rock State Park Beach	SHELL Use Supported	Median: 97/6060 10%: 304/6060
Gualala Regional Park Beach	SHELL Use Supported	Median: 52/6120 10%: 120/6120
Salmon Creek Park (South)	SHELL Use Supported	Median: 42/6150 10%: 90/6150
Stillwater Cove Regional Park Beach	SHELL Use Supported	Median: 72/6030 10%: 160/6030

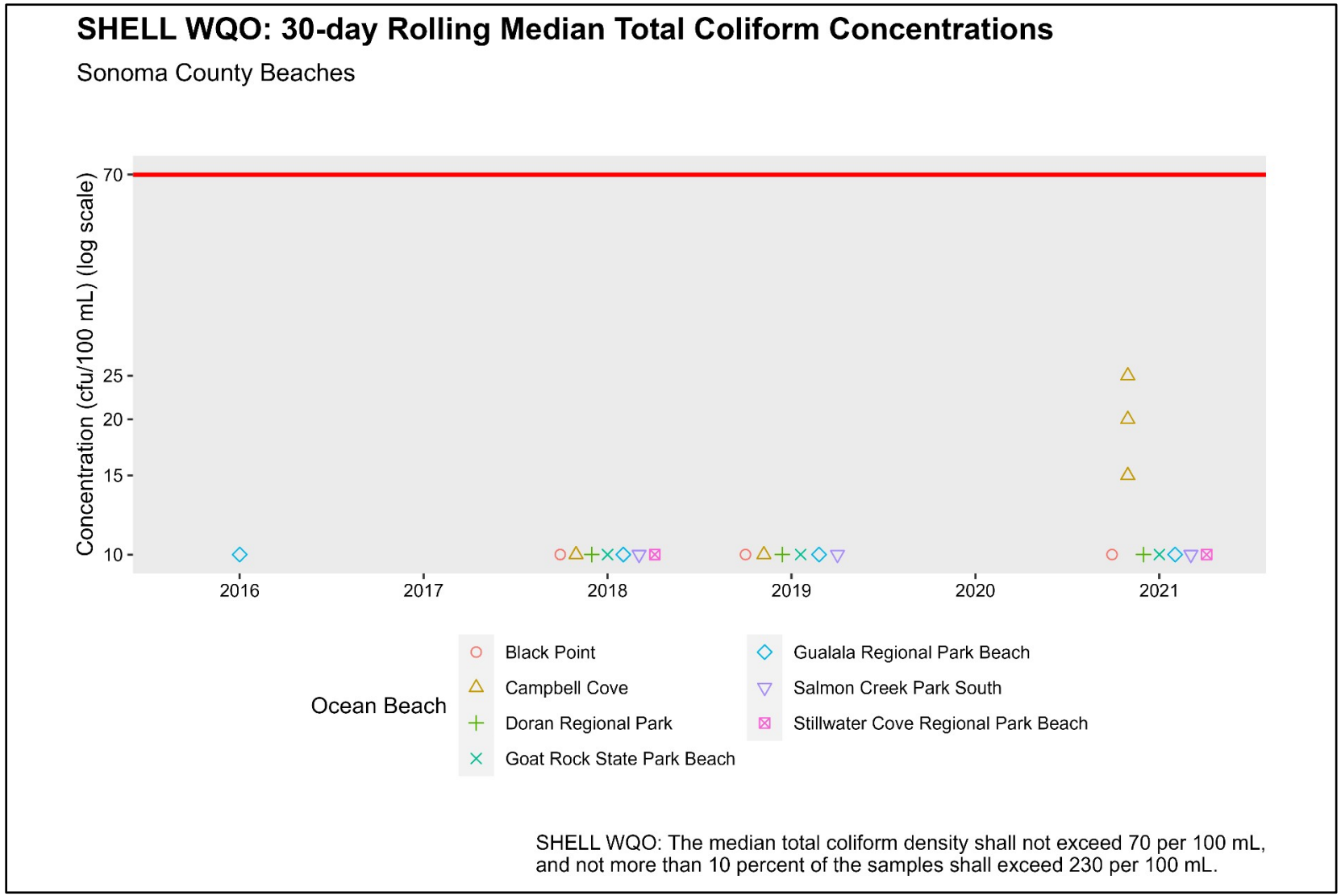

Figure 14 Exceedance of the Median Threshold of the SHELL Objective by Sonoma County Beaches

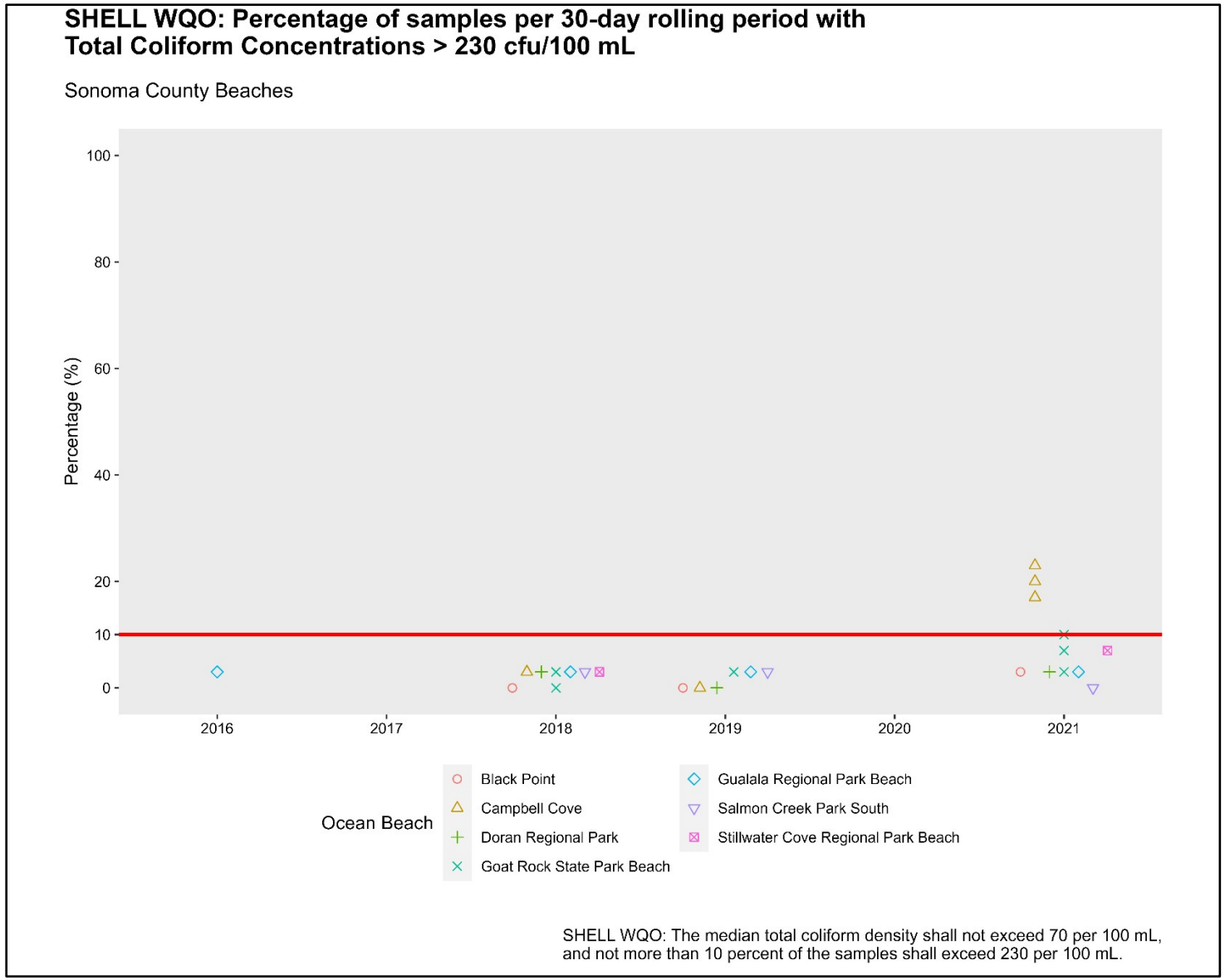

Figure 15 Exceedance of the 10% Threshold of the SHELL Objective by Sonoma County Beaches

4.3. Summary of FIB data

The enterococci and total coliform data from all 19 ocean beaches are summarized (number of samples collected, minimum, median, and maximum concentrations) in Appendix Tables B1 through B6 respectively. Across all 19 ocean beaches enterococci concentrations ranged from 0 MPN/100 mL to 24196 MPN/100 mL, and total coliform concentrations ranged from 0 MPN/100 mL to 24196 MPN/100 mL

5. Discussion

The purpose of this technical report is to present an assessment of FIB data collected from 19 North Coast ocean beaches between May 2015 and May 2022 to evaluate current conditions and determine whether these ocean beaches violate REC-1 or SHELL objectives for ocean waters. Ocean beaches that exceed the REC-1 or SHELL objectives may require source control actions. MST data, targeting dog-, gull-, human-, and ruminant-specific markers, have also been collected as part of the Ocean Beaches Monitoring Study to evaluate the sources of fecal waste at these beaches. These MST data have been evaluated in the report entitled "Assessment of Microbial Source Tracking Data and Land Cover and Land Use Data from 12 Ocean Beaches and 22 Coastal Streams in the North Coast Region (North Coast Regional Water Quality Control Board, 2023a). An additional report entitled "Coastal Pathogen Project Summary Report" (North Coast Regional Water Quality Control Board, 2023b) has also been developed to assess, in total, the various lines of evidence collected from all the water bodies sampled as part of the Coastal Pathogens Project. This report will recommend actions to address the evidence of pollution detected in the waterbodies assessed as part of the Coastal Pathogens Project. Various potential outcomes are possible, including investigation of individual sources of fecal waste, development of a more focused monitoring study, and/or development of a more robust regulatory program for the control of fecal waste discharge.

5.1. Summary of assessment findings

Tables 23, 24, and 25 below present the results of the assessment of the comparison of all 19 beaches to the REC-1 and SHELL objectives for ocean waters for ocean beaches in Humboldt, Mendocino, and Sonoma Counties, respectively. For each table, an "X" (cross) mark indicates that a particular Objective has been exceeded where as a "√" (check) mark indicates that a particular Objective has not been exceeded.

Table 23 Ocean Beaches Exceeding the REC-1 or SHELL Objective (Humboldt County)

Ocean Beach	REC-1 Objective Exceedance Assessment[a,b]	SHELL Objective Exceedance Assessment[a,b]
Clam Beach (near Mad River Mouth)	X	X
Clam Beach (near Strawberry Creek)	X	X
Luffenholtz Beach	X	X
Moonstone County Park	X	X
Old Home Beach	X	X
Trinidad State Beach	X	X

[a]An "X" (cross) mark indicates that an ocean beach exceeds the REC-1 or SHELL Objective.
[b]A "√" (check) mark indicates that an ocean beach does not exceed the REC-1 or SHELL Objective.

Table 24 Ocean Beaches Exceeding the REC-1 or SHELL Objective (Mendocino County)

Ocean Beach	REC-1 Objective Exceedance Assessment[a,b]	SHELL Objective Exceedance Assessment[a,b]
Big River Beach at Mendocino Bay	✓	X
Caspar Headlands State Beach	✓	X
Hare Creek Beach	X	X
MacKerricher State Park (near Virgin Creek)	X	X
Pudding Creek Beach	X	X
Van Damme State Park (beach area)	X	X

[a]An "X" (cross) mark indicates that an ocean beach exceeds the REC-1 or SHELL Objective.
[b]A "√" (check) mark indicates that an ocean beach does not exceed the REC-1 or SHELL Objective.

Table 25 Ocean Beaches Exceeding the REC-1 or SHELL Objective (Sonoma County)

Ocean Beach	REC-1 Objective Exceedance Assessment[a,b]	SHELL Objective Exceedance Assessment[a,b]
Black Point	✓	X
Campbell Cove	X	X
Doran Regional Park	X	X
Goat Rock State Park Beach	✓	X
Gualala Regional Park Beach	✓	X
Salmon Creek Park (South)	✓	X
Stillwater Cove Regional Park Beach	✓	X

[a]An "X" (cross) mark indicates that an ocean beach exceeds the REC-1 or SHELL Objective.
[b]A "√" (check) mark indicates that an ocean beach does not exceed the REC-1 or SHELL Objective.

6. References

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Assembly Bill No. 411, (1997) (testimony of Howard Wayne & Debra Bowen).

Appendix A: North Coast Ocean Beaches and Impairment Status on the 2020/2022 Section 303(d) List (REC-1 and SHELL Beneficial Use)

Table A 1 North Coast Ocean Beaches and Impairment Status on the 2020/2022 Section 303(d) List (REC-1 and SHELL Beneficial Use [BU])

Ocean Beach[a]	REC-1 BU[b,c]				SHELL BU[b]	
	Enterococci		Fecal Coliform		Total Coliform	
	GM[d]	STV[d]	GM[d]	SSM[d]	Median	10%
Albion River Beach[e]	--	✓	--	--	--	--
Anchor Bay Beach[e]	--	✓	--	--	--	--
Arena Cove Beach[e]	--	✓	--	--	--	--
Big River Beach at Mendocino Bay	✓	✓	✓	✓	X	--
Black Point	✓	✓	✓	✓	✓	--
Campbell Cove	×	×	×	×	×	--
Caspar Headlands State Beach	✓	✓	✓	✓	×	--
Chadbourne Gulch Beach[e]	--	✓	✓	✓	✓	--
Clam Beach (near Mad River mouth)	✓	✓	✓	✓	×	×
Clam Beach (near Strawberry Creek)	×	×	✓	✓	×	--
Doran Regional Park	✓	✓	✓	✓	✓	--
Glass Beach[e]	--	✓	--	--	--	--
Goat Rock State Park Beach	✓	✓	✓	✓	✓	--
Greenwood State Beach[e]	✓	✓	--	--	✓	--

Ocean Beach[a]	REC-1 BU[b,c]				SHELL BU[b]	
	Enterococci		Fecal Coliform		Total Coliform	
	GM[d]	STV[d]	GM[d]	SSM[d]	Median	10%
Gualala Regional Park Beach	✓	✓	✓	✓	✓	--
Hare Creek Beach	✓	✓	✓	✓	×	--
Irish Beach[e]	--	✓	--	--	--	--
Jug Handle State Reserve Beach[e]	--	✓	--	--	--	--
Luffenholtz Beach	×	×	✓	✓	×	--
MacKerricher State Park (near Mill Creek)[e]	✓	✓	✓	✓	✓	--
MacKerricher State Park (near Virgin Creek)	✓	✓	✓	✓	×	--
Mendocino Coast HU, Garcia River Hydrologic Area, Saunders Reef[e]	--	✓	--	--	--	--
Moonstone County Park	✓	✓	✓	✓	×	--
Navarro River Beach[e]	✓	✓	--	--	×	--
Noyo River Beach[e]	--	✓	--	--	--	--
Old Home Beach	✓	✓	✓	✓	×	--
Pudding Creek Beach	✓	✓	✓	✓	×	--
Russian Gulch[e]	✓	✓	--	--	×	--
Salmon Creek Park (South)	✓	✓	✓	✓	✓	--
Stillwater Cove Regional Park Beach	✓	✓	✓	✓	✓	--
Ten Mile Beach[e]	--	✓	--	--	--	--

Ocean Beach[a]	REC-1 BU[b,c]				SHELL BU[b]	
	Enterococci		Fecal Coliform		Total Coliform	
	GM[d]	STV[d]	GM[d]	SSM[d]	Median	10%
Trinidad State Beach	×	×	✓	✓	×	--
Van Damme State Park (beach area)	✓	✓	✓	✓	×	--
Wages Creek Beach[e]	--	✓	--	✓	--	--
Westport Union Landing Beach[e]	--	✓	--	--	--	--

[a]Ocean Beaches assessed as being impaired for REC-1 or SHELL beneficial use are marked in bold

[b]✓ – Assessed, beneficial use not impaired; x – Assessed, beneficial use impaired; -- – Not assessed

[c]The California Ocean Plan (2019) also has a fecal coliform-based Objective for REC-1 beneficial use. The fecal coliform-based Objective was more commonly used in the past.

[d]GM – Geometric Mean; STV – Statistical Threshold Value; SSM – Single Sample Maximum

[e]Enterococci and total coliform data not available for the May 2015 through May 2022 timeframe

Appendix B: FIB Summary Tables

Table B 1 Enterococci Data Summary (Humboldt County)

Ocean Beach	Number of Samples Assessed	Enterococci Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
Clam Beach (near Mad River mouth)	194	10	10	24196
Clam Beach (near Strawberry Creek)	236	10	52	1046
Luffenholtz Beach	227	10	41	7270
Moonstone County Park	214	10	10	7270
Old Home Beach	18	10	10	906
Trinidad State Beach	219	10	10	3609

[a]MPN – Most Probable Number

Table B 2 Enterococci Data Summary (Mendocino County)

Ocean Beach	Number of Samples Assessed	Enterococci Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
Big River Beach At Mendocino Bay	210	0	10	161
Caspar Headlands State Beach	212	0	10	743
Hare Creek Beach	209	0	10	228
MacKerricher State Park Near Virgin Creek	119	0	10	41
Pudding Creek Beach	212	0	10	798
Van Damme State Park (beach area)	209	0	10	1658

[a]MPN – Most Probable Number

Table B 3 Enterococci Data Summary (Sonoma County)

Ocean Beach	Number of Samples Assessed	Enterococci Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
Black Point	203	10	10	63
Campbell Cove	204	1	10	3076

Ocean Beach	Number of Samples Assessed	Enterococci Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
Doran Regional Park	202	10	10	5335
Goat Rock State Park Beach	203	10	10	495
Gualala Regional Park Beach	203	10	10	41
Salmon Creek Park (South)	206	10	10	97
Stillwater Cove Regional Park Beach	201	10	10	96

[a]MPN – Most Probable Number

Table B 4 Total Coliform Data Summary (Humboldt County)

Ocean Beach	Number of Samples Assessed	Total Coliform Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
Clam Beach (near Mad River mouth)	239	2	52	5172
Clam Beach (near Strawberry Creek)	284	10	1872	16000
Luffenholtz Beach	279	10	712	24196
Moonstone County Park	270	10	607	24196
Old Home Beach	16	78	460	16000
Trinidad State Beach	270	10	280.5	24196

[a]MPN – Most Probable Number

Table B 5 Total Coliform Data Summary (Mendocino County)

Ocean Beach	Number of Samples Assessed	Total Coliform Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
Big River Beach At Mendocino Bay	224	0	20	959
Caspar Headlands State Beach	227	0	63	9804
Hare Creek Beach	223	0	121	13546

Ocean Beach	Number of Samples Assessed	Total Coliform Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
MacKerricher State Park Near Virgin Creek	123	0	20	8664
Pudding Creek Beach	225	0	10	24196
Salmon Creek Park (South)	205	10	10	1050
Van Damme State Park (beach area)	209	0	10	2481

[a]MPN – Most Probable Number

Table B 6 Total Coliform Data Summary (Sonoma County)

Ocean Beach	Number of Samples Assessed	Total Coliform Concentration (MPN/100 mL)[a]		
		Minimum	Median	Maximum
Black Point	203	10	10	253
Campbell Cove	208	10	10	5794
Doran Regional Park	203	10	10	441
Goat Rock State Park Beach	202	3.1	10	6131
Gualala Regional Park Beach	204	10	10	1918
Salmon Creek Park (South)	205	10	10	1050
Stillwater Cove Regional Park Beach	201	10	10	2014

[a]MPN – Most Probable Numb