

**STATE WATER RESOURCES CONTROL BOARD**  
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

**DRAFT STAFF REPORT**

**2018 INTEGRATED REPORT**  
FOR CLEAN WATER ACT SECTIONS 305(b) AND 303(d)



**March 19, 2020**

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CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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## List of Regulatory Acronyms and Abbreviations

Basin Plan:	Regional Water Quality Control Plan
BPTCP:	Bay Protection and Toxic Cleanup Program
CalWQA:	California Water Quality Assessment (Database)
CCAMP:	Central Coast Ambient Monitoring Program
CCC:	Criteria Continuous Concentration
CCR:	California Code of Regulations
CDPH:	California Department of Public Health
CFR:	Code of Federal Regulations
CMC:	Criteria Maximum Concentration
CTR:	California Toxics Rule
CWA:	Clean Water Act
FED:	Functional Equivalent Document
DFW:	California Department of Fish and Wildlife, formerly Department of Fish and Game (DFG)
ILRP:	Irrigated Lands Regulatory Program
IR:	Integrated Report
ISWEBE:	Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California
Listing Policy:	Water Quality Control Policy for Developing California's Section 303(d) List
LOE:	Line of Evidence
MTRL:	Maximum Tissue Residue Level
MWMT:	Maximum Weekly Maximum Temperature
NAS:	National Academy of Sciences
NOAA:	National Oceanic and Atmospheric Administration
NPDES:	National Pollutant Discharge Elimination System
OEHHA:	California Office of Environmental Health Hazard Assessment
QA:	Quality Assurance
QAPP:	Quality Assurance Project Plan
QC:	Quality Control
Regional Water Board:	Regional Water Quality Control Board
SFEI:	San Francisco Estuary Institute
SMCL:	Secondary Maximum Contaminant Level
SMWP:	State Mussel Watch Program
SQG:	Sediment quality guideline
State Water Board:	State Water Resources Control Board
SWAMP:	Surface Water Ambient Monitoring Program
TIE:	Toxicity Identification Evaluation
TMDL:	Total Maximum Daily Load
TSMP:	Toxic Substance Monitoring Program
U.S. EPA:	U.S. Environmental Protection Agency
USGS:	U.S. Geological Survey
WDR:	Waste Discharge Requirement
WQO:	Water Quality Objective

WQS: Water Quality Standard

## List of Scientific Acronyms and Abbreviations

BMI:	Benthic Macro Invertebrates
°C:	Degrees Celsius
°F:	Degrees Fahrenheit
DDE:	Dichlorodiphenyldichloroethylene
DDT:	Dichlorodiphenyltrichloroethane
DO:	Dissolved Oxygen
dw:	Dry Weight
ERM:	Effects Range Median
HCH:	Hexachlorocyclohexane
HAS:	Hydrologic Sub Area
HU:	Hydrologic Unit
IBI:	Index of Biological Integrity
Kg:	Kilogram(s)
MCL:	Maximum Contaminant Level
MDL:	Method Detection Limit
mg/kg:	Milligrams per Kilogram (parts per million)
mg/L:	Milligrams per Liter (parts per million)
µg/g:	Micrograms per Gram (parts per million)
µg/L:	Micrograms per Liter (parts per billion)
MTBE:	Methyl Tertiary-butyl Ether
ng/g:	Nanograms per Gram (parts per billion)
ng/L:	Nanograms per Liter (parts per trillion)
NTU:	Nephelometric Turbidity Unit
oc:	Organic Carbon
PAH:	Polynuclear Aromatic Hydrocarbon
PBDE:	Polybrominated Diphenyl Ethers
PCB:	Polychlorinated Biphenyl
PEL:	Probable Effects Level
pg/L:	Picograms per Liter
RBI:	Relative Benthic Index
RL:	Reporting Level
TDS:	Total Dissolved Solids
TL:	Trophic Level
TSS:	Total Suspended Solids
ww:	Wet Weight

## Executive Summary

The goal of the Clean Water Act (“CWA”) is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” (33 U.S.C § 1251(a).) Pursuant to Clean Water Act sections 303(d) and 305(b) (33 U.S.C. §§ 1313(d), 1315(b)), each state is required to report to the U.S. Environmental Protection Agency (“U.S. EPA”) on the overall quality of the waters within its boundaries. The U.S. EPA then compiles these reports into their biennial “National Water Quality Inventory Report” to Congress. Under CWA section 303(d), states are required to review, make changes as necessary, and submit to U.S. EPA a list identifying waterbodies not meeting water quality standards and the water quality parameter (i.e., pollutant) not being met (referred to as the “303(d) list”). States are required to include a priority ranking of such waters, taking into account the severity of the pollution and the uses to be made of such waters, including waters targeted for the development of total maximum daily loads (“TMDLs”). Under CWA section 305(b), each state is required to report biennially to the U.S. EPA on the water quality conditions of its surface waters (referred to as the “305(b) report”). States are required to submit their 303(d) lists and 305(b) reports every two years (the “listing cycle”). (40 C.F.R. § 130.7(d).) The State Water Resources Control Board (“State Water Board”) administers this portion of the CWA for the State of California. The U.S. EPA developed guidance to states recommending that the 305(b) report and the 303(d) list be integrated into a single report. For California, this combined report is called the “California Integrated Report” and it satisfies both the CWA section 305(b) and section 303(d) requirements.

For the 2018 listing cycle, assessments are focused on surface waters in the North Coast, Lahontan, and Colorado River regions, as these regions are “on cycle.” All readily available data from waterbodies in these regions were considered. The San Francisco Bay, Los Angeles, Central Valley, and San Diego Regional Water Boards conducted “off-cycle” assessments for one or more waterbodies within their respective regions.

The 2018 Integrated Report updates the 2014/2016 Integrated Report. The updates are based on data and information collected from surface waterbodies (rivers, streams, lakes, bays, estuaries, enclosed lagoons, and coastal waters) located in the aforementioned regions. The updates include changes to the 303(d) list and, pursuant to CWA section 305(b), describe the extent to which surface waters in the state are supporting beneficial uses.

This staff report provides background on the methods used to compile and assess the data. Surface water data were downloaded from the California Environmental Data Exchange Network (CEDEN) and National Water Quality Monitoring Portal for assessment. Data sources include the Water Boards’ Surface Water Ambient Monitoring Program (SWAMP) and other monitoring programs; other state agencies such as the Department of Fish and Wildlife and the Department of Pesticide Regulation; federal agencies such as the U.S. Geological Service and U.S. EPA; Tribes; and local watershed groups. Based on assessments of these data, 178 new listings



and 47 new delistings are recommended for the 303(d) list. The assessments are summarized in Waterbody Fact Sheets (see Appendices B and C).

For the 2018 listing cycle, the Lahontan, Colorado River, San Francisco Bay, Los Angeles, and Central Valley Regional Water Boards considered and approved each of their proposed 303(d) lists at a public hearing after providing advance notice and opportunity for comment and responding to all comments. The North Coast Regional Water Board compiled Waterbody Fact Sheets and assembled draft listing and delisting recommendations but did not administer the public process for its region. The State Water Board is administering the listing process for all waters within the North Coast Region in accordance with section 6.2 of the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List. The San Diego Regional Water Board's changes were limited to the 305(b) report.

Upon approval of the 303(d) list portion of the 2018 Integrated Report by the State Water Board, the California Integrated Report is submitted to U.S. EPA, which may make changes to the 303(d) list before it approves the final 303(d) list for California.

## 1. About the Integrated Report

The State Water Board, along with the nine Regional Water Quality Control Boards (“Regional Water Boards”) (collectively referred to as the “Water Boards”), protect and enhance the quality of California’s water resources through implementing the Clean Water Act (“CWA”) as amended (33 U.S.C. § 1251 et seq.; CWA, § 101 et seq.), and California’s Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 et seq.).

States that administer the CWA must submit the CWA section 303(d) list of impaired waters to the U.S. Environmental Protection Agency (“U.S. EPA”). CWA section 305(b) requires each state to report biennially to U.S. EPA on the condition of its surface water quality. U.S. EPA guidance to the states recommends the two reports be integrated (U.S. EPA, 2005). For California, this integrated report is called the “California Integrated Report” and combines the State Water Board’s section 303(d) and 305(b) reporting requirements.

### 1.1. The 303(d) List of Impaired Waters

Federal regulation defines a “water quality-limited segment” as “any segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after application of technology-based effluent limitations required by CWA sections 301(b) or 306.” (40 C.F.R. § 130.2(j).) Water segments are also known as waterbodies or waters, and water quality-limited segments are also known as “impaired waterbodies” or “impaired waters.” Under CWA section 303(d), states are required to review, make changes as necessary, and submit to U.S. EPA a list of water quality-limited segments that are not meeting, or are not expected to meet, water quality standards. This is referred to as the 303(d) list of impaired waters, or the “303(d) list.” The 303(d) list must identify the pollutants causing lack of attainment of water quality standards and include a priority ranking of the water quality-limited segments taking into account the severity of the pollution and the uses to be made of the waters. (40 C.F.R. § 130.7(b)(iii)(4).) To restore water quality, a total maximum daily load (“TMDL”) or other regulatory action must be developed to address the impaired waterbodies on the 303(d) list.

Since there may be more than one pollutant causing lack of attainment of water quality standards, each 303(d) listing decision is specific to a pollutant, and there may be multiple 303(d) listings for one waterbody.

#### 1.1.1. The Listing Policy

Recommendations to place a waterbody on the 303(d) list are made in conformance with the Water Quality Control Policy for Developing California’s Clean Water Act Section 303(d) List, commonly referred to as the “Listing Policy.” (SWRCB 2015.) The Listing Policy identifies the process by which the Water Boards comply with the listing requirements of CWA section 303(d).

The Listing Policy provides direction related to the:

1. Definition of readily available data and information. Readily available data and information is defined as data and information that can be submitted to the California Environmental Data Exchange Network (CEDEN), unless the data type cannot be accepted by CEDEN. Data types that CEDEN cannot accept can be submitted directly to the State Water Board following a procedure established during the data solicitation process.
2. Administration of the listing process including data solicitation and fact sheet preparation.
3. Application and interpretation of chemical-specific water quality standards; bacterial water quality standards; health advisories; bioaccumulation of chemicals in aquatic life tissues; nuisance such as trash, odor, and foam; nutrients; water and sediment toxicity; adverse biological response; and degradation of aquatic life populations and communities.
4. Interpretation of narrative water quality objectives using numeric evaluation guidelines.
5. Data quality assessments including following an approved Quality Assurance Project Plan (QAPP).
6. Data quantity assessments including water segment specific information, data spatial and temporal representation, aggregation of data by reach/area, quantitation of chemical concentrations, evaluation of data consistent with the expression of water quality objectives or criteria, binomial model statistical evaluation, evaluation of bioassessment data, and evaluation of temperature data.
7. The use of a situation-specific weight of evidence approach when all other factors do not result in a listing or delisting where information suggests standards nonattainment or attainment, respectively.

## **1.2. The 305(b) Report - Integrated Report Condition Categories**

To meet CWA section 305(b) requirements of reporting on water quality conditions, the Integrated Report places each waterbody into one of five “Integrated Report Condition Categories.” This categorization is based on the assessment of all available data collected in that waterbody.

**Figure 1: 305(b) Integrated Report Condition Categories**

<b>1</b>	At least one core beneficial use is supported and none are known to be impaired.
<b>2</b>	Insufficient information to determine beneficial use support.
<b>3</b>	There is insufficient data and/or information to make a beneficial use support determination but information and/or data indicates beneficial uses may be potentially threatened.
<b>4</b>	<p>At least one beneficial use is not supported but a TMDL is not needed.</p> <p><b>4a:</b> A TMDL has been developed and approved by U.S. EPA for any waterbody-pollutant combination, and the approved implementation plan is expected to result in full attainment of the water quality standard within a reasonable, specified time frame.</p> <p><b>4b:</b> Another regulatory program is reasonably expected to result in attainment of the water quality standard within a reasonable, specified time frame.</p> <p><b>4c:</b> The non-attainment of any applicable water quality standard for the waterbody segment is the result of pollution and is not caused by a pollutant.</p>
<b>5</b>	At least one beneficial use is not supported and TMDL is needed.

The 303(d) list portion of the California Integrated Report consists of waterbodies in Categories 4a, 4b, and 5. U.S. EPA considers only waterbodies in Category 5 to be responsive to the reporting requirements of CWA section 303(d).

### **1.3. Integrated Report Cycles**

The Integrated Report is developed in “cycles.” Each Integrated Report cycle consists primarily of assessments from the three Regional Water Boards that are “on-cycle.” The other six Regional Water Boards that are “off-cycle” may also assess new high-priority data and make new listing or delisting recommendations or changes to the section 305(b) categories.

Each Integrated Report cycle (“listing cycle”) builds from the assessments from the previous cycle. The 303(d) listing decisions and 305(b) waterbody category

assignments from the prior cycle are first carried over into the new cycle. All readily available data received during the data solicitation period for the new cycle are then assessed and the listings and categories are updated, as appropriate. These updates are incorporated into the new cycle. Thus the 2018 Integrated Report is an updated version of the 2014/2016 Integrated Report and contains all prior assessments as well as any new or updated assessments based on the data received prior to the end of the data solicitation period for the 2018 listing cycle.

## 2. Assessment Process

This section describes the rationale, methods, and procedures employed by Water Board staff to assess data for the 2018 California Integrated Report.

### 2.1. Data and Information Used

The State Water Board solicited public data and information from November 3, 2016, to May 3, 2017. All readily available data and information submitted for Regions 1, 6, and 7, and a limited number of high priority data from Regions 2, 4 and 5, were considered. Specifically, data and information that were reviewed included:

- The 2014/2016 303(d) list and its supporting data and information
- Surface Water Ambient Monitoring Program (SWAMP) data
- Irrigated Lands Regulatory Program monitoring data
- Southern California Coastal Water Research Project data
- San Francisco Estuary Institute's Regional Monitoring Program data
- Federal and tribal surface water quality data from the National Water Quality Monitoring Portal
- Fish and shellfish advisories; beach postings, advisories, and closures; or other water quality-based restrictions
- Reports of fish kills, cancers, lesions, or tumors
- Existing and readily available water quality data and information reported by local, state, and federal agencies (including receiving water monitoring data from discharger monitoring reports), citizen monitoring groups, academic institutions, and the public
- Existing internal Water Board data and reports
- Other sources of data and information that became readily available to Water Board staff

All readily available data and information (as defined by section 6.1.1 of the Listing Policy) were considered in the development of the 2018 California Integrated Report. Water Board staff developed Lines of Evidence (LOEs) in the California Water Quality Assessment database that summarized the available data and information and used these LOEs to make 303(d) listing recommendations and overall beneficial use support ratings.

### 2.2. Mapping and Data Organization

Data received from the 2018 solicitation were processed as described below to prepare for analysis.

**Mapping:** Staff reviewed monitoring station locations to determine representative waterbody segments for assessment. New monitoring stations were either associated with existing mapped waterbody segments or new waterbody segments were mapped to represent the new stations. Waterbody segments were mapped to account for hydrologic features or as described in the Basin Plans. The beneficial uses were

identified for each waterbody segment. Some waterbodies may have been re-segmented, split into additional segments, or had a modification to the waterbody name since the 2014/2016 Integrated Report was approved. These and other non-substantive mapping modifications are summarized in Appendix G: Miscellaneous Mapping Changes Report.

**Quality Review:** Data quality was evaluated in two ways. First, Water Board staff reviewed the quality control information included with each dataset to screen out erroneous or inaccurate entries. Second, all datasets were associated with an approved Quality Assurance Project Plan (QAPP), unless the data came from a monitoring program (such as SWAMP) specifically exempted from this requirement by the Listing Policy. Only data supported by an approved QAPP, or exempt from the QAPP requirement, were used as primary LOEs to make determinations of water quality standards attainment. In the absence of quality assurance documentation, data were used as ancillary evidence and not the basis of a listing decision. A list of the datasets and associated QAPPs from the 2018 data solicitation is available in the References Report (Appendix H).

**Other processing:** Where applicable, the raw data were mathematically processed to prepare for comparison to water quality objectives, criteria, or other evaluation guidelines. For example, the objective may specify an averaging period (annual, weekly, four-day, etc.) or the evaluation guideline may depend on the concentration of another constituent (ammonia and hardness, for example). The available data were used to represent concentrations during the averaging period associated with the pollutant and evaluation guideline. For example, if only one data point was available during a four-day period, it was used to represent the four-day average concentration for that period.

## **2.3. Data Analysis**

Data analysis was conducted by assessing data collected from a waterbody to determine if its beneficial uses are supported. Pollutant concentrations were compared to thresholds protective of beneficial uses. Whether or not these thresholds were exceeded describes a waterbody's ability to support its beneficial uses and determines whether to recommend listing, not listing, delisting, or not delisting the waterbody-pollutant combination on the 303(d) list.

### **2.3.1. Lines of Evidence and Decisions**

The raw data were organized into individual LOEs and compared to the applicable thresholds (objective, criteria, or evaluation guidelines) to determine the beneficial use support rating. An LOE was prepared for each unique combination of a waterbody, pollutant, matrix, fraction, beneficial use, and threshold. The term "matrix" refers to the sample medium used in an LOE, such as water, sediment, or tissue. The "fraction" is the analyzed portion of the sample medium. For example, if the matrix of a sample is water, then the fraction can be either the total constituent or the dissolved portion of the constituent. The procedure to identify beneficial uses and the corresponding thresholds for each LOE is described Section 2.4, below.

Three possible beneficial use support ratings were used: Fully Supporting, Not Supporting, and Insufficient Information. These are the standard use support ratings designed by U.S. EPA for the Integrated Report. In general, the following approach, as described in the Listing Policy, was used to determine beneficial use support ratings when assessing monitoring data.

- Fully Supporting: Pollutants do not exceed standards with a frequency that cause a 303(d) listing.
- Not Supporting: Pollutants exceed standards with a frequency that cause a 303(d) listing.
- Insufficient Information: It cannot be determined if a use is supported or not supported. This usually occurs when the data have poor quality assurance; there are not enough samples in a dataset; there is no existing numerical criterion, objective, or evaluation guideline; or the information alone cannot support an assessment.

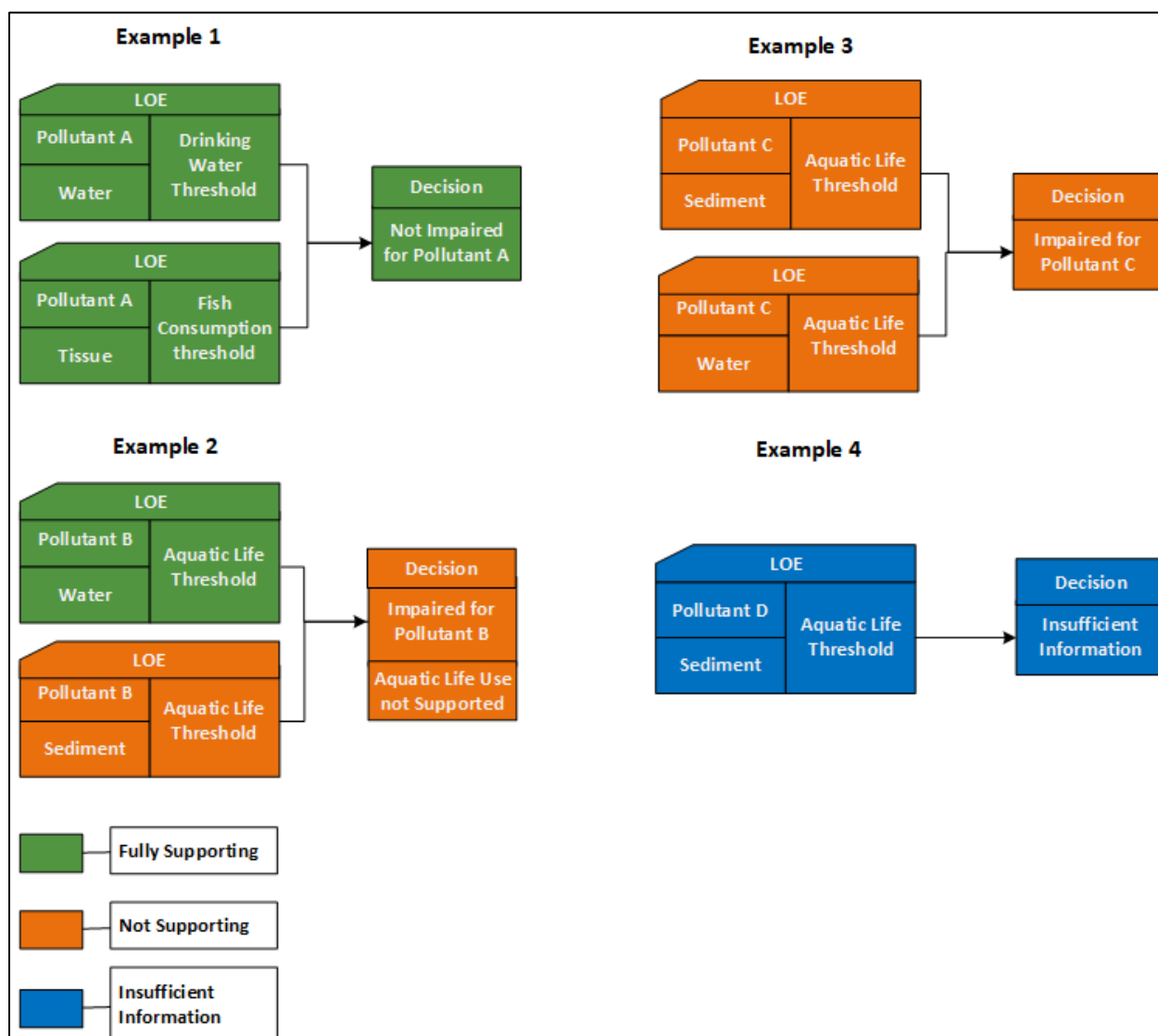
Since the 2012 Listing Cycle, an extra condition is used to determine the beneficial use support rating of Fully Supporting. This condition is that a monitoring dataset must also consist of at least 26 samples for conventional pollutants, and at least 16 samples for toxic pollutants, before a use could be rated as Fully Supporting. The sample size condition was derived from the number of samples required in the Listing Policy to run the binomial test, which is used to calculate the number of exceedances per sample size that would cause a 303(d) listing.

The individual LOEs were then aggregated into waterbody-pollutant combinations and waterbody-pollutant decisions ("Decisions") were made. Waterbody-pollutant combinations not supporting beneficial uses were added to the 303(d) list, as described in section 2.3.2, below.

See Figure 2 for examples of how LOEs are aggregated into Decisions based on beneficial use support ratings.



**Figure 2: Example of Aggregation of LOEs into Decisions and Use Support Ratings**



### 2.3.2. 303(d) List Evaluations

Each waterbody-pollutant combination is evaluated as required by the Listing Policy to determine whether it is impaired and suitable for placement on the 303(d) list. Section 3 of the Listing Policy describes the factors used to add waters to the 303(d) list ("listing factors"). Section 4 of the Listing Policy describes the factors to remove waters from the 303(d) list ("delisting factors"). The listing and delisting factors are summarized below.

Listing a waterbody-pollutant combination is determined if adequate data exist to show that any of the following statements were true:

1. Evaluation of beneficial use support results in a rating of Not Supporting. Numeric data exceed the numeric objective or evaluation guideline more than the prescribed number of times. The number of times varies by the number of

samples and is based on a binomial distribution as described in the Listing Policy. See sections 3.1, 3.2, 3.3, 3.5, and 3.6 the Listing Policy for more information.

2. A health advisory against the consumption of edible resident organisms or a shellfish harvest ban has been issued. See section 3.4 of the Listing Policy for more information.
3. Nuisance conditions exist for odor, taste, excessive algae growth, foam, turbidity, oil, trash, litter, and color when compared to reference conditions. See section 3.7 of the Listing Policy for more information.
4. Adverse biological response is measured in resident individuals as compared to referenced conditions and the impacts are associated with water or sediment concentrations of pollutants. See section 3.8 of the Listing Policy for more information.
5. Significant degradation of biological populations and/or communities is exhibited as compared to reference sites and is associated with water or sediment concentrations of pollutants. See section 3.9 of the Listing Policy for more information.
6. A trend of declining water quality standards attainment is exhibited. See section 3.10 of the Listing Policy for more information.
7. The weight of evidence demonstrates that a water quality standard is not attained. See section 3.11 of the Listing Policy for more information.

Delisting a waterbody-pollutant combination from the 303(d) list is determined if adequate data exist to show that any of the following statements were true:

1. Evaluation of beneficial use support results in a rating of Fully Supporting. Numeric data do not exceed the numeric objective or evaluation guideline more than the prescribed number of times. The number of times varies by the number of samples and is based on a binomial distribution as described in the Listing Policy. See sections 4.1, 4.2, 4.3, 4.5 and 4.6 of the Listing Policy for more information.
2. A health advisory has been removed or the evaluation guideline is no longer exceeded. See section 4.4 of the Listing Policy for more information.
3. The water segment no longer satisfies the conditions for a nuisance listing. See section 4.7 of the Listing Policy for more information.
4. Adverse biological response is no longer evident or associated water or sediment pollutants are no longer exceeded. See section 4.8 of the Listing Policy for more information.
5. Degradation of biological populations and/or communities is no longer evident or associated water or sediment pollutants are no longer exceeded. See Section 4.9 of the Listing Policy for more information.
6. Trends in water quality are not substantiated or impacts are no longer observed. See Section 4.10 of the Listing Policy for more information.
7. The weight of evidence demonstrates that a water quality standard is attained. See Section 4.11 of the Listing Policy for more information.

The statewide 2018 303(d) list and the 303(d) list for the waterbodies in the North Coast Region were developed with the following assumptions:

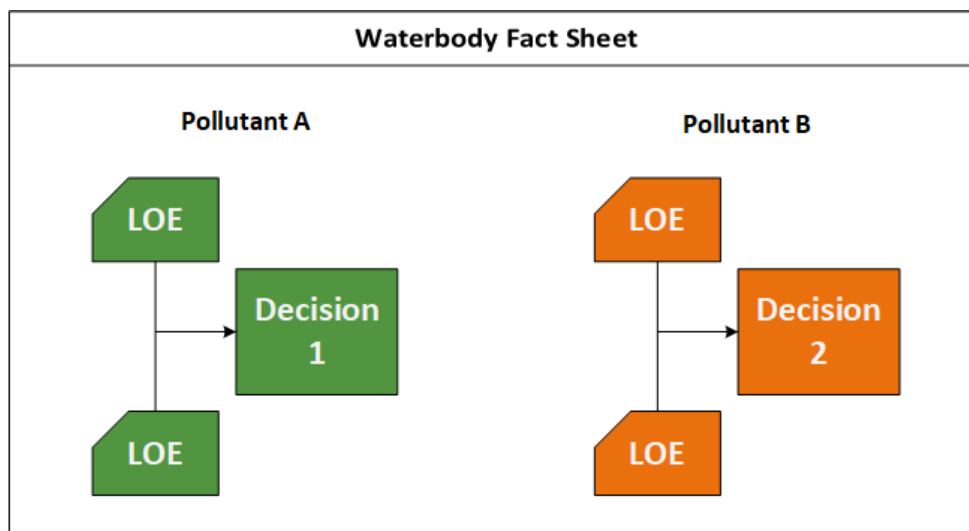
1. The 2014/2016 303(d) list (Appendix I) would form the basis for the 2018 303(d) list submittal.
2. The provisions of the Listing Policy would direct staff recommendations.
3. Invasive species would be considered as pollutants and would be considered for inclusion on the section 303(d) list.
4. Waterbody-pollutant listings were independent of the TMDLs that have been approved and are being implemented for the waterbody. If a waterbody-pollutant combination is removed from the list for any reason, the delisting would have no effect on the validity or requirements for implementing a TMDL that has been adopted and approved by U.S. EPA. Implementation of water quality control plan provisions was not affected by the section 303(d) list.
5. Provisions of Basin Plans, statewide water quality control plans, and other documents containing water quality standards were used as they are written. Judgments were not made during the list development process regarding the suitability, quality, or applicability of beneficial uses or water quality objectives.
6. Novel approaches for interpreting objectives were not used unless the approach was specifically allowed by the applicable water quality standards (e.g., analyzing wet and dry season data separately).

As stated above, the 2014/2016 303(d) list was the basis for developing the 303(d) listing recommendations for the 2018 list. If a waterbody-pollutant was listed on the 2014/2016 list, a recommendation was made to either keep it on the list (not delist) or delist it. If the waterbody-pollutant combination was not listed on the 2014/2016 list, a recommendation was made to either list it or keep it as not listed. The determination for each waterbody-pollutant combination along with a presentation of the data assessment and the recommended changes, when applicable, were documented in Waterbody Fact Sheets (see Appendices B and C).

### **2.3.3. Waterbody Fact Sheets**

The LOEs and Decisions for each waterbody were summarized in Waterbody Fact Sheets (see Figure 3). In each waterbody, data from multiple pollutants may be assessed, resulting in more than one waterbody-pollutant Decision.

**Figure 3: Waterbody Fact Sheets**



Potential sources were only identified in Fact Sheets when a specific source analysis has been performed as part of a TMDL or other regulatory process. Otherwise, the potential source was marked "Source Unknown." Detailed Waterbody Fact Sheets for all waterbodies assessed for the 2018 Integrated Report are available in Appendices B and C.

#### **2.3.4. Integrated Report Condition Categories**

The beneficial use support ratings (described in Section 2.3.1, above) were the basis for determining the overall Integrated Report Category for each assessed waterbody.

If a waterbody segment had no existing or proposed 303(d) listings and at least one beneficial use was fully supported, it was placed in Category 1. If use support could not be determined for at least one beneficial use, the waterbody segment was placed into Category 2. If there was indication of impairment but there were insufficient data to list, the waterbody was placed in Category 3. This approach was taken to prevent waterbodies with insufficient data from being classified as fully attaining standards, thus providing a more accurate baseline for future assessments.

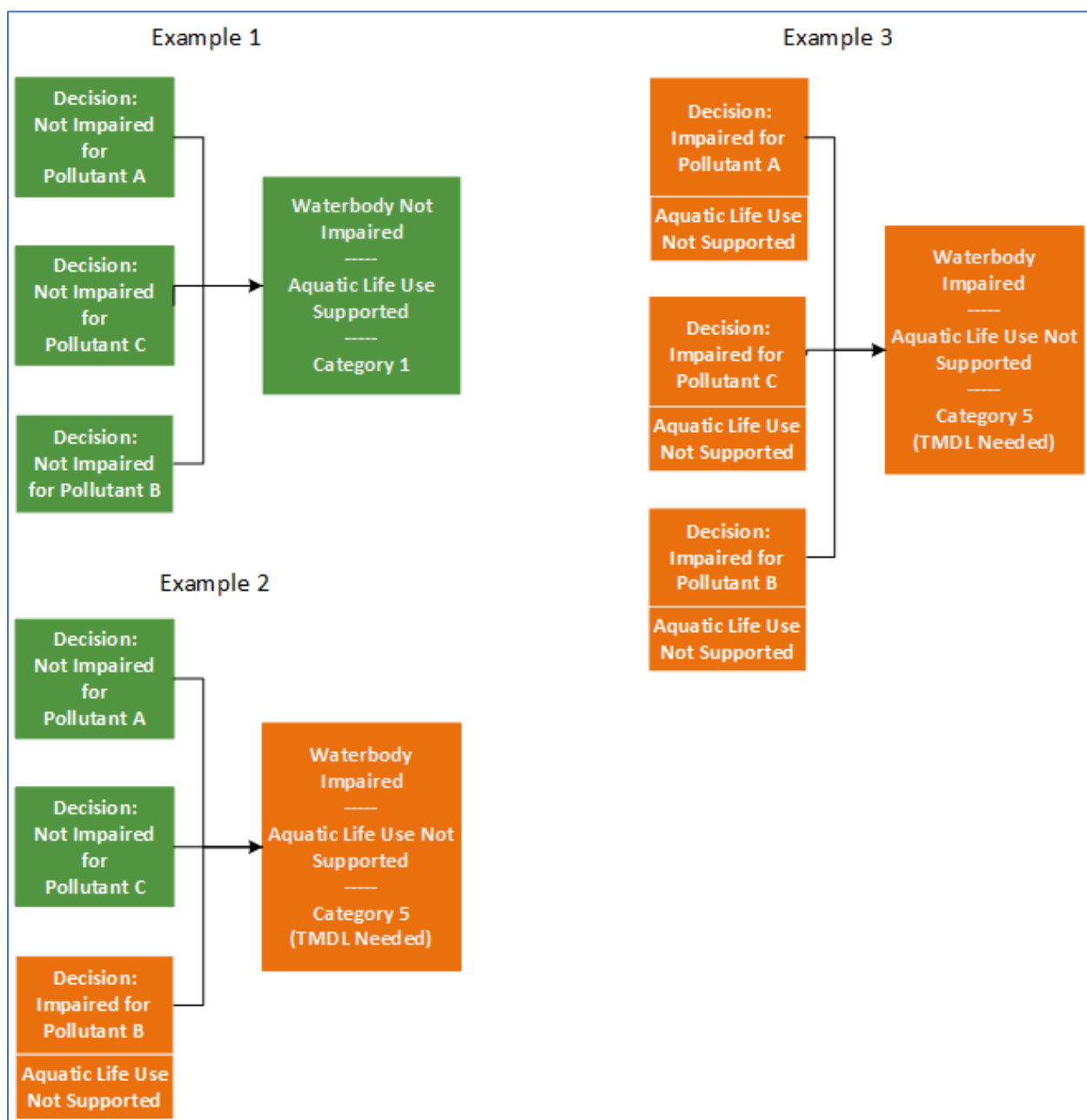
If there were one or more 303(d) listings in the waterbody needing a TMDL, it was placed into Category 5. The waterbody remains in Category 5 until TMDLs are developed or another regulatory program is expected to attain standards. Waterbodies where one or more impairments exist, but a TMDL is not needed, are placed in Category 4. There are three reasons why a TMDL would not be needed for a waterbody with 303(d) listings. One, a TMDL has been adopted and approved by U.S. EPA. Waterbodies with at least one U.S. EPA-approved TMDL were placed in Category 4a. Two, another regulatory program is expected to remove the impairment within a reasonable timeframe. Waterbodies were placed into Category 4b if it was determined that actions from another regulatory program will result in beneficial use attainment. Three, the impairment was not caused by a pollutant but rather caused by pollution, such as flow alteration or habitat alteration. Waterbodies where impairment is

caused by pollution were placed in Category 4c. The 303(d) list is comprised of waterbodies in Categories 4a, 4b, and 5.

In some circumstances, TMDLs have been adopted by the Water Board in the past but the approvals from U.S. EPA are pending. In these cases, the waterbody remained in Category 5.

See Figure 4, below, for examples of how Integrated Report Categories are determined based on the results of beneficial use support ratings. See also Appendix D.

**Figure 4: Examples of Integrated Report Condition Category Determination**



## 2.4. Beneficial Uses and Thresholds

The beneficial uses for waters of California are identified in the Regional Water Boards' Water Quality Control Plans ("Basin Plans") or statewide water quality control plans, including the Water Quality Control Plan for Ocean Waters of California ("Ocean Plan") and the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries ("ISWEBE Plan"). See Table 1 for a list of beneficial uses.

**Table 1: Summary Table of Beneficial Uses**

Beneficial Use	Definition
<b>MUN</b>	<b>Municipal and Domestic Supply:</b> Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water.
<b>AGR</b>	<b>Agricultural supply:</b> Uses of water for farming, horticulture or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
<b>REC-1</b>	<b>Water Contact Recreation:</b> Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.
<b>REC-2</b>	<b>Non-Contact Water Recreation:</b> Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
<b>COMM</b>	<b>Ocean Commercial and Sport Fishing:</b> Uses of water for commercial or recreational collection of fish and shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.
<b>SHELL</b>	<b>Shellfish Harvesting:</b> Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, abalone, and mussels) for human consumption, commercial or sport purposes.

<b>WARM</b>	<b>Warm Fresh Water Habitat:</b> Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
<b>COLD</b>	<b>Cold Fresh Water Habitat:</b> Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
<b>EST</b>	<b>Estuarine Habitat:</b> Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
<b>MAR</b>	<b>Marine Habitat:</b> Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).
<b>RARE</b>	<b>Rare, Threatened, or Endangered Species:</b> Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.
<b>WILD</b>	<b>Wildlife Habitat:</b> Uses of water that support terrestrial ecosystems including, but not limited to, preservation or enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
<b>MIGR</b>	<b>Migration of Aquatic Organisms:</b> Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.
<b>CUL</b>	<b>Tribal Tradition and Culture:</b> Uses of water that support the cultural, spiritual, ceremonial, or traditional rights or lifeways of California Native American Tribes, including, but not limited to: navigation, ceremonies, or fishing, gathering, or consumption of natural aquatic resources, including fish, shellfish, vegetation, and materials.
<b>T-SUB</b>	<b>Tribal Subsistence Fishing:</b> Uses of water involving the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities of California Native American Tribes to meet needs for sustenance.

<b>SUB</b>	<b>Subsistence Fishing:</b> Uses of water involving the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities, to meet needs for sustenance.
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If a beneficial use was not designated for a water segment in a Basin Plan or statewide water quality control plan, but it was determined that the use exists in the water segment, the water segment was assessed using the existing beneficial use of the water. For example, where fish tissue data were available, they were assessed based on the applicable fish consumption thresholds even if the commercial and sportfishing (COMM) beneficial use was not specifically assigned to the waterbody. Where fish tissue data are available, it is concluded that the data were collected because people are consuming fish from the waterbody, and therefore the beneficial use is assumed to exist.

Beneficial use support was determined by comparing the data to a protective threshold. Thresholds may be water quality objectives, water quality criteria or other applicable evaluation guidelines that were selected in accordance with the Listing Policy.

When available, numeric water quality objectives and criteria were used to evaluate beneficial use attainment. The numeric water quality objectives are established in Basin Plans or in statewide water quality control plans, including the ISWEBE Plan and the Ocean Plan. These include any site-specific objectives (“SSOs”) established in these plans. Additionally, numeric water quality objectives and criteria include:

- Maximum Contaminant Levels (numeric objectives by reference in some Basin Plans) to the extent applicable. Examples include:
  - Table 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of the California Code of Regulations, title 22, section 64431
  - Table 64444-A (Organic Chemicals) of the California Code of Regulations, title 22, section 64444
  - Tables 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) and 64449-B (Secondary Maximum Contaminant Levels-Ranges) of the California Code of Regulations, title 22, section 64449
- The establishment of numeric criteria for priority toxic pollutants for the State of California (“California Toxics Rule” or “CTR”) thresholds (40 C.F.R. § 131.38)

If no numeric water quality objectives or criteria were available, evaluation guidelines were selected in conformance with section 6.1.3 of the Listing Policy. This section describes the process for selecting guidelines for sediment quality, fish and shellfish consumption, aquatic life protection from bioaccumulation of toxic substances, as well as other parameters. For example, this section refers to thresholds published by the U.S. EPA or the California Office of Environmental Health Hazard Assessment (“OEHHA”) as appropriate evaluation guidelines for assessment.



All objectives, criteria and evaluation guidelines used for 2018 assessments are listed in Appendix C: Statewide Waterbody Fact Sheets.

## **2.5. Pollutant Assessment Methods**

This section explains some of the analyses conducted in more detail to provide a better understanding of how data and information were evaluated.

### **2.5.1. Bacteria**

Bacteria data from waterbodies with the water contact recreation (REC-1) beneficial use were assessed in accordance with the statewide bacteria objectives or site-specific objectives where applicable. The indicators for assessment depended on the salinity of the water. Saline waters are defined as waters where the salinity is greater than one part per thousand more than five percent of the time. *E. coli* is the bacteria indicator for freshwater and enterococci for inland saline, estuarine, and marine waters. Fecal coliform is a second indicator in marine waters. The bacteria objectives include two numeric values for each indicator, one based on a six-week or 30-day geometric mean (geomean) and another based on a statistical threshold value (STV) or single sample maximum (SSM) calculated on a monthly basis. For listing assessments, the geomean only was used if a statistically sufficient number of samples was available (generally not less than five samples collected over the specified averaging period). In waterbodies where the number of samples was too small to calculate a geomean, the STV or SSM values may have been used per the weight of evidence approach outlined in sections 3.11 and 4.11 of the Listing Policy. Beach notification information, if available, may also have been used in the weight of evidence evaluations.

Bacteria data were also used to assess for attainment of the municipal drinking water (MUN) beneficial use in the Lahontan Region using the Lahontan Basin Plan numeric fecal coliform objective.

### **2.5.2. Pesticides, Other Organic Chemicals, and Metals**

Pollutant concentrations in water, sediment, and tissue were assessed based on applicable thresholds. Most assessments were a direct comparison of the result with the threshold, while some assessments included manipulation of the result before comparison with the threshold. A result that was over the threshold was considered an exceedance. More detailed explanations of assessment methods by matrix are included in the subtopics below.

#### ***Water matrix***

Pesticides, organic chemicals, and metals data from water column samples were assessed using objectives, criteria, or guidelines, including those from the CTR, U.S. EPA national recommended water quality criteria (U.S. EPA, 2019b), maximum contaminant levels, U.S. EPA aquatic life benchmarks (U.S. EPA, 2019a), U.S. EPA Office of Pesticide Programs' Pesticide Ecotoxicity Database (U.S. EPA 2012a), or

other sources that meet requirements of the Listing Policy. An explanation is provided below on thresholds specific to a type of pollutant or a pollutant that required data manipulation.

### *Pesticides*

Many legacy pollutants, such as DDT and other organochlorine pesticides, were assessed with criteria from the CTR or the national recommended water quality criteria.

While most sources provided one threshold, the aquatic life benchmarks and the Ecotoxicity Database provided many studies for selection of a threshold. The lowest aquatic life benchmark reported for a pesticide was selected as the threshold to use for assessments. A threshold from the Ecotoxicity Database may be based on a single study or include multiple studies combined as a geomean or maximum acceptable toxicant concentration. Studies from the Ecotoxicity Database were required to meet certain parameters for use as a threshold. The parameters focused on quality and applicability of the study and included:

- Whether the study was classified as a core study
- Whether the study was conducted on freshwater
- Whether the chemical used in the study was greater than 80% pure
- Whether the endpoint in the study was linked to survival, growth, or reproduction
- Whether the species studied was in a family that resides in North America
- The acceptable standard or equivalent method used
- The toxicity values that were calculated or were calculable (i.e., LC50)

### *Other organic chemicals*

Polychlorinated biphenyls (PCBs) were evaluated based on CTR guidance to sum the PCB aroclors for aquatic life and either congeners, or aroclors for human health for comparison to criteria protective of human health and aquatic life. CTR guidance was followed to derive aquatic life criteria dependent on pH for the organochlorine, pentachlorophenol.

### *Metals*

The CTR includes hardness-adjusted criteria for cadmium, copper, chromium, lead, nickel, silver and zinc. The criteria were calculated based on the equations provided in the CTR. The calculated criteria were then compared with the data result. Chromium species (III, VI) were summed before comparison with the criteria.

### ***Sediment matrix***

Evaluation guidelines for assessment of pollutant concentration data in sediment were selected in accordance with section 6.1.3 of Listing Policy. See below for an explanation of pesticide assessments that required data manipulation.

## *Pesticides*

The toxicity of some pesticides is dependent on the amount of organic carbon within the soil. If the threshold selected for assessment was based on organic carbon normalization, the pesticide data was also organic carbon normalized (using the organic carbon content from the same area) for comparison of the result with the threshold. Data for the following pesticides were organic carbon-normalized: pyrethroids, fipronil, fipronil metabolites, and the organophosphates chlorpyrifos, diazinon, and methyl parathion.

## ***Tissue Matrix - Fish and Shellfish***

Pesticides, other organic chemicals, and metals (except mercury) in fish and shellfish tissue were assessed based on a modified version of the Fish Contaminant Goals (FCG) developed by OEHHA. (OEHHA 2008). The FCG are modified by replacing the 0.7 cooking reduction factor with a value of 1.0. A cooking reduction factor is a numeric value that approximates the amount of contaminant removed from tissue by cooking. A cooking reduction factor of 1.0 implies there is no reduction in contaminant concentration from cooking. U.S. EPA guidance allows for the assumption of no contaminant loss during preparation and cooking (U.S. EPA 2000). Tissue sample fractions were reported as either "whole organism" or "fish fillet." The modified OEHHA FCGs were used for assessment (with the exception of mercury) of both whole organism and fish fillet data. Information related to assessment of specific pollutants is provided in the below subtopics.

## *Arsenic*

Total arsenic results were multiplied by 0.10 for conversion to inorganic arsenic.

## *Polycyclic Aromatic Hydrocarbons (PAHs)*

Polycyclic aromatic hydrocarbons (PAHs) were assessed by comparing a potency-weighted total concentration of PAHs with the threshold for benzo(a)pyrene. The potency-weighted concentration was calculated for each PAH by multiplying the concentration of the PAH by a toxicity equivalency factor (TEF). The TEF is the toxicity of each PAH relative to benzo(a)pyrene. The potency-weighted concentrations for all PAHs were summed to create the potency-weighted total concentration for total PAH. The potency-weighted total concentration was then compared with the threshold for benzo(a)pyrene.

## *Mercury*

For comparison with the mercury objectives, mercury data were assessed as datasets. Each dataset was an annual average of all fish analyzed and is grouped by waterbody or station, collection period ("calendar year"), trophic level (TL), beneficial use, and objective. Each annual average was considered one sample. The data may have been

reported as individual fish or multiple fish per composite. Annual composite averages were weighted when composites have unequal number of fish or samples were a mix of composites and individuals. Annual averages were based on fish grouped into trophic levels and not specific fish species.

The mercury assessments were based on the appropriate objective applied to each beneficial use for a waterbody. Beneficial uses assessed included COMM, WILD, and MAR.

For the sport fish objective, data from trophic level three and four fish species were used for assessment of COMM. Fish used for the assessment must follow length requirements noted in Table 2 for the trophic level. In addition, fish lengths smaller or larger than the California Department of Fish and Wildlife's fishing regulation legal size limits are not be used for COMM assessments. Data missing total length will utilize fork length when fork length is greater than 150 mm. Additional information on trophic levels and fish lengths is located in Table C-1 of Part 2 of the ISWEBE Plan (SWRCB 2017).

Only data from trophic level four may be used to assess for WILD when applying the sport fish objective. However, trophic level three fish species may be used to assess for WILD when applying the sport fish objective if the sample exceeds the objective.

For the prey fish objective, data from any fish species and trophic level were used for assessment of WILD. Fish used for the assessment must follow length requirements noted in Table 2 for the trophic level. All prey fish sample results collected February 1 – July 31 (breeding season) may be used for assessments. Sample results collected August 1 to January 31 may be used to assess for impairment but not compliance with the prey fish objective.

**Table 2: New Water Quality Objectives, Beneficial Uses, Water Quality Objective Length Requirements and New Numeric Objectives**

<b>Mercury Objective Category</b>	<b>Beneficial Use</b>	<b>Fish Length (total length in mm)</b>	<b>Mercury Objective (mg/kg)</b>
Sportfish TL4	COMM, WILD, MAR, CUL	200-500	0.2
Sportfish TL3	COMM, WILD, MAR, CUL	150-500	0.2
Prey Fish (any species)	WILD	50-150	0.05

California Least Tern (not applicable in the North Coast Region)	RARE	<50	0.03
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The objectives are interpreted as an absolute value and are not assigned a designated number of significant figures.

Determination of waterbody placement on the 303(d) list based on tissue is described in sections 3.4 and 3.5 of the Listing Policy. Listing Policy section 3.11 (the situation specific weight of evidence approach) may be utilized to determine placement on the 303(d) list if information indicates non-attainment of standards. For a flow chart illustrating fish tissue mercury assessments for the 2018 Integrated Report, see Appendix F.

## **Toxicity**

Toxicity tests are conducted in a laboratory by exposing test organisms, consisting of vertebrate, invertebrate, and plant species, to water or sediment samples collected in the field. Test and control organism responses (e.g., mortality, growth, reproduction) are measured and results are evaluated to determine if there is a statistically significant difference in responses between the test and the control organisms. In addition, the percent effect to the test organisms in the sample is calculated. The percent effect is a measure of the similarity between the organisms in the sample matrix and the control organisms. This two-tiered evaluation system can produce four different results as shown in Table 3, below.

**Table 3: Significant Effect (“SigEffect”) Code Results**

<b>Code</b>	<b>Definition</b>	<b>Explanation</b>
“Not Significant, Greater Similarity” (NSG)	The test result is not statistically significant and shows a greater similarity to the control (i.e., the percent effect is below the 20% threshold).	The result indicates that the sample is not toxic. This data can be used with confidence.
“Not Significant, Less Similarity” (NSL)	The test result is not statistically significant, but shows less similarity to the control (i.e., the percent effect is equal to or greater than the 20% threshold).	The result indicates that the sample may or may not be toxic, and that further investigation is necessary.
“Significant, Greater Similarity” (SG)	The test result is statistically significant, but shows greater similarity to the control (i.e., the percent effect is below the 20% threshold).	The result indicates that the sample may or may not be toxic, and that further investigation is necessary.
“Significant, Less Similarity” (SL)	The test result is statistically significant and shows less similarity to the control (i.e., the percent effect is equal to or greater than the 20% threshold).	The result indicates that the sample is toxic. This data can be used with confidence.

For the purposes of Integrated Report assessments, only samples with a Significant Effect Code of “SL” were used. The SL code is applied when:

- There is a statistically significant difference between the response of the organism in the sample matrix and the control organism.
- There is less similarity between the organism in the sample matrix and the control organism, as determined by the percent effect of the sample. The

percent effect evaluation threshold for SWAMP data is set at 20 percent for both chronic and acute toxicity.

A sample is defined as a water or sediment sample collected from the same location on the same day. Although the sample may be tested with multiple test species, it is still one sample. Toxicity of any one or more test species of a sample, as noted by application of the “SL” to the data, is an exceedance. One LOE may summarize the results for multiple test species and may include the test species that exhibited toxicity.

### 2.5.3. Biological Integrity and Habitat Indices

The California Stream Condition Index (CSCI) is a biological scoring tool which translates complex data about benthic macroinvertebrates found living in a stream into an overall measure of stream health (Mazor et al., 2016). The CSCI score is calculated by comparing the expected condition with actual (observed) results. CSCI scores range from 0 (highly degraded) to greater than 1 (equivalent to reference). CSCI scoring of biological conditions are shown in Table 4.

**Table 4: CSCI Score Ranges and Biological Conditions**

CSCI Score Range	Condition
$\geq 0.92$	Likely intact
0.91 – 0.80	Possibly altered
0.79 – 0.63	Likely altered
$\leq 0.62$	Very likely altered

*Adapted from Rehn et al., 2015*

When evaluating bioassessment data, the threshold of 0.79 was used as the evaluation guideline for beneficial use attainment. Waterbodies with CSCI scores below 0.79 indicate the waterbody’s condition is either likely altered or very likely altered and, therefore, the aquatic life beneficial use is not being supported.

Pursuant to the Listing Policy, any waterbody proposed for 303(d) listing for benthic community effects must also have other 303(d) impairments identified for that waterbody. Biological assessments do not identify the cause(s) of an impairment. Such identification takes place during development of a TMDL or other action to address impairment, which is outside the scope of the Integrated Report.

In addition to evaluating benthic macroinvertebrate data using the CSCI, ancillary LOEs were developed for physical habitat data using the Index of Physical Habitat Integrity (IPI) (Andrew C. Rehn, Raphael D. Mazor, Peter R. Ode, 2018) where IPI scores were available. Physical characteristics of a site vary due to both natural factors and human disturbance. Statistical models based on a large statewide reference data set distinguish natural variability from anthropogenic stress. These models work across the

diverse stream types found in California. The IPI is a multi-metric index that uses these models to characterize physical habitat condition for streams in California. Index scores near 1.0 indicate physical habitat conditions similar to reference conditions, whereas lower scores indicate degradation. For the purposes of making statewide assessments, three thresholds (analogous to those used for the CSCI) were established based on the 30th, 10th, and 1st percentiles of IPI scores at reference sites. These three thresholds divide the IPI scoring range into 4 categories of physical condition as shown in Table 5.

**Table 5: Index of Physical Habitat Integrity**

<b>IPI Score Range</b>	<b>Condition</b>
$\geq 0.94$	Likely intact
0.94 – 0.84	Possibly altered
0.83 – 0.71	Likely altered
$\leq 0.70$	Very likely altered

Scores of 0.83 or lower indicate that the physical habitat has been altered and low CSCI scores from this site may be due to impacts to the physical habitat. These habitat assessments inform how physical habitat alterations may impact CSCI scores. This information can be used to determine the appropriate management action when CSCI scores show beneficial uses not to be supported. Ancillary LOEs, or LOEs that support other data assessments, are developed using physical habitat assessment data. Ancillary LOEs cannot be used by themselves to support a listing recommendation but they can be used in combination with other LOEs when making a decision recommendation. In this case, physical habitat LOEs provided additional support for the LOEs for benthic macroinvertebrate data in benthic community effects decision recommendations.

## **2.6. TMDL Prioritization and Scheduling**

The Regional Water Boards undergo a prioritization process to develop TMDL completion schedules for their impaired waterbody-pollutant combinations. Each Regional Water Board reviews their 303(d) listings and prioritizes TMDLs for completion based on the following factors from section 5 of the Listing Policy:

- Waterbody significance (such as importance and extent of beneficial uses, threatened and endangered species concerns, and size of waterbody)
- Degree that water quality objectives are not met or beneficial uses are not attained or threatened (such as the severity of the pollution or number of pollutants/stressors of concern) [40 CFR 130.7(b)(4)]
- Degree of impairment
- Potential threat to human health and the environment
- Water quality benefits of activities ongoing in the watershed



- Potential for beneficial use protection and recovery
- Degree of public concern
- Availability of funding
- Availability of data and information to address the water quality problem.

Since 2009, Regional Water Boards have adopted a total of 114 TMDLs to address various water quality impairments. A summary table of TMDLs adopted by each of the nine Regions since 2009 can be found in Appendix E.

### **3. North Coast Region 303(d) List**

The North Coast Regional Water Board was “on-cycle” for the 2018 listing cycle. Staff assessed total of 179 waterbodies, containing 2,792 waterbody-pollutant combinations. Based on these assessments, 42 waterbody-pollutant combinations are recommended to be added to and one waterbody-pollutant combination is recommended to be removed from the 303(d) list.

The State Water Board is administering the public process for the North Coast Regional Water Board. The proposed listing and delisting recommendations for the waterbodies within the North Coast Region are subject to written and oral public comment. The State Water Board will receive oral comments on waterbodies proposed for addition or deletion from the 303(d) list at a hearing. The Water Board will respond to timely written and oral comments and, if needed, will release a revised staff report prior to the meeting during which the State Water Board will consider adopting the proposed 303(d) list for the North Coast Region.

#### **3.1 North Coast Region Assessment Procedure**

Assessment procedures specific to the North Coast Regional Water Board are described in the following subsections.

##### **3.1.1. Use of Temperature Data**

Two common ways to measure water temperatures are by “grab sample,” which involves a point-in-time measurement of water temperature, and by continuous measurement of water temperature utilizing a water quality monitoring instrument that is deployed in a waterbody for a prolonged period of time and records the water temperature at set intervals.

Continuous water temperature data can be used to calculate several water temperature metrics including the maximum weekly maximum temperature (MWMT). The MWMT is also known as the seven-day average of the daily maximum temperatures (7DADM) and is the maximum seasonal or yearly value of the daily maximum temperatures over a running seven-day consecutive period. The MWMT is useful because it describes the maximum temperatures in a stream in a season or in a year but is not overly influenced by the maximum temperature of a single day.

By their nature, MWMTs are a robust metric of the water temperatures in a waterbody, because they require a year or season’s worth of continuously monitored temperature data to calculate a single MWMT. Grab sample data, on the other hand, are a point-in-time measurement that only captures water temperatures at a particular date and time and may not capture the hottest time of day or time of year.

Therefore, for water temperature listing and delisting decisions that had both MWMT and grab sample data, the MWMT data were used to make listing and delisting determinations, as they are a much more robust metric of temperature conditions and capture the peak temperatures in the waterbody that are of the greatest concern to the

protection of beneficial uses. All continuous water temperature data available for a specific site in a given year were used to calculate the MWMT, rather than utilizing a seasonal window. A minimum of five years or five summer seasons of continuous temperature monitoring data (five MWMTs) were necessary to make new listing and delisting determinations.

### **3.1.2. Use of Secondary Maximum Contaminant Levels (SMCLs)**

Metals and other data were assessed under the chemical constituents objective for the protection of the municipal and domestic supply (MUN) beneficial use. The MUN beneficial use applies to both domestic and municipal water supplies, including domestic water supply systems which deliver untreated surface water for consumption and household use.

Per the Basin Plan, secondary maximum contaminant levels (SMCLs) should be applied to protect the MUN beneficial use. SMCLs are set at a level to protect aesthetic considerations such as taste, color, and odor and do not represent a risk to public health.

SMCLs can be applied through either the taste and odor objective or the chemical constituents objective for the protection of MUN with the same outcome. The LOEs were developed as appropriate utilizing the chemical constituents objective as the basis for applying the SMCLs for metals as appropriate criteria.

Proposed listings for the 2018 listing cycle based upon exceedance of SMCLs are for aluminum and manganese and are listed below in Table 10.

### **3.1.3. Updating Metals and Pesticide Fact Sheets**

In past listing cycles, metals and pesticide data were evaluated and summarized as a group in a single LOE, which discussed multiple pollutants. The multi-pollutant LOE was then discussed in a Decision, which addressed multiple pollutants.

For the 2018 listing cycle, all data within the multi-pollutant LOEs were reevaluated and single-pollutant LOEs were created. Single pollutant Decisions have been created for all metals. Although many of the multi-pollutant pesticide Decisions were updated, some pesticides are still discussed together in a Decision, which has been named “Pesticides.” The remaining multi-pollutant pesticide Decisions will be updated during the next listing cycle to ensure that each individual pesticide is discussed as a single pollutant Decision.

### **3.1.4. Russian River Watershed Indicator Bacteria Data Assessment**

Prior to the 2018 Integrated Report cycle, indicator bacteria data for the Russian River watershed were evaluated on a stream, stream reach, or watershed scale depending on the available data. For the 2018 listing cycle, indicator bacteria data in the Russian River watershed were reassessed as follows. A U.S. Geological Survey hydrologic unit code 12, “HUC-12” subwatershed was identified as impaired if: 1) levels exceeded the statewide bacteria objective for *E. coli* in freshwater or enterococci in saline water more

than the allowable frequency in the Listing Policy; or 2) applying the situation specific weight of evidence factors, levels exceeded the U.S. EPA criteria for enterococci in freshwater more than the allowable frequency in the Listing Policy and a public health advisory was posted at any recreational beach in the HUC-12 anytime in the period of 2013 through 2018. If adopted as recommended, the 303(d) list for waterbodies in the North Coast Region expands the current indicator bacteria listings to include 17 HUC-12 subwatersheds within 11 waterbodies in the Russian River watershed.

### ***Overview of the Russian River Watershed and Hydrologic Units***

The Russian River Watershed encompasses 1,484 square miles in Sonoma and Mendocino counties, California. Major incorporated cities within the watershed include Ukiah, Cloverdale, Healdsburg, Windsor, Rohnert Park, Santa Rosa, and Sebastopol. The watershed also includes numerous unincorporated communities such as Calpella, Hopland, Forestville, Guerneville, and Monte Rio. The 110-mile mainstem channel of the Russian River originates in the Redwood Valley of central Mendocino County about 15 miles north of Ukiah and enters the Pacific Ocean in Sonoma County at Jenner. The Russian River serves as the primary water source for more than 500,000 residents in Mendocino, Sonoma, and Marin counties and for agricultural production in Mendocino and Sonoma counties. It provides multiple water-based recreational opportunities important to the economies of the watershed and well-being of residents and visitors.

### ***Overview of the Russian River Watershed Pathogen TMDL***

The *Action Plan for the Russian River Watershed Pathogen Total Maximum Daily Load* ("Pathogen TMDL Action Plan") was adopted by the North Coast Region on August 14, 2019. The Pathogen TMDL Action Plan is not in effect at the time of this writing. The Pathogen TMDL Action Plan is based on the authorities and requirements of both the CWA and the state Porter-Cologne Water Quality Control Act (Porter Cologne) and applies to the entire Russian River Watershed. The Pathogen TMDL Action Plan: 1) summarizes the elements of the TMDL; 2) summarizes findings relative to pollution and impairment assessment; and 3) describes the program of implementation designed to control fecal waste pollution, achieve bacteria water quality objectives (bacteria objectives), and restore the water contact recreation (REC-1) beneficial use to protect public health. The overall goal of the Pathogen TMDL Action Plan is to minimize human exposure to waterborne disease-causing pathogens and to protect uses of water for recreational activities such as wading, swimming, fishing, and boating.

### ***Russian River Watershed Uses, Objectives, and Data***

REC-1 is a year-round beneficial use of the Russian River Watershed. Current applicable water quality objectives include the statewide numeric bacteria objectives for *E. coli* in freshwater and enterococci in saline waters found in Part 3 of the ISWEBE Plan. The studies associated with development of the Russian River Pathogen TMDL resulted in multiple additional lines of evidence of REC-1 impairment, including: public health advisories, enterococci exceedances using U.S. EPA's 2012 Clean Water Act

section 304(a) recommended national water quality criteria, human and bovine *Bacteroides*, and Phylochip™ analyses.

Pathogen TMDL water quality monitoring studies were conducted in 2009-2014 using multiple indicator bacteria which provided evidence of seasonal and episodic fecal waste pollution at locations throughout the watershed. Several waterbodies within the Russian River Watershed were identified in the 2012 303(d) list based on these fecal indicator bacteria (FIB) data and others, including fecal coliform data. At that time the North Coast Basin Plan numeric objective for the protection of REC-1 used the fecal coliform indicator. In February 2019, statewide bacteria objectives for the protection of REC-1 in inland surface waters, enclosed bays, and estuaries took effect using *E. coli* fecal indicator bacteria for freshwater and enterococci fecal indicator bacteria for saline water. The *E. coli* and enterococci bacteria objectives were set at allowable rates of illness deemed acceptable for the protection of public health (e.g., 32 gastrointestinal illness per 1,000 recreators). The statewide bacteria objectives superseded the North Coast Basin Plan's fecal coliform bacteria objective for REC-1 uses in freshwater. Therefore, fecal coliform data were not assessed for the 2018 Integrated Report.

The FIB data were reassessed based on subwatershed boundaries defined by the HUC-12 subwatersheds. The Russian River Watershed is divided into 43 HUC-12 subwatersheds as outlined in Table 6, below. Assessment based on HUC-12 allowed for a more refined assessment of impairment than would have been the case using the Hydrologic Subareas defined in the Basin Plan.

**Table 6: Russian River HUC-12 Subwatersheds**

Hydrologic Area	Hydrologic Sub Area	Hydrologic Unit Code 12 (HUC-12) Subwatersheds
Upper Russian River	Coyote Valley	Burright Creek-East Fork Russian River
Upper Russian River	Coyote Valley	Cold Creek
Upper Russian River	Coyote Valley	Lake Mendocino-East Fork Russian River
Upper Russian River	Forsythe Creek Ukiah	Forsythe Creek
Upper Russian River	Forsythe Creek Ukiah	Salt Hollow Creek-Russian River
Upper Russian River	Forsythe Creek Ukiah	East Fork Russian River-Russian River
Upper Russian River	Sulphur Creek	Little Sulphur Creek
Upper Russian River	Sulphur Creek	Alder Creek-Big Sulphur Creek

Upper Russian River	Ukiah	Ackerman Creek
Upper Russian River	Ukiah	Mill Creek
Upper Russian River	Ukiah	Orrs Creek-Russian River
Upper Russian River	Ukiah	Robinson Creek
Upper Russian River	Ukiah	Morrison Creek-Russian River
Upper Russian River	Ukiah	Dooley Creek
Upper Russian River	Ukiah	McNab Creek-Russian River
Upper Russian River	Ukiah	Feliz Creek
Upper Russian River	Ukiah	Pieta Creek
Upper Russian River	Ukiah	Cummiskey Creek-Russian River
Middle Russian River	Geyserville	Oat Valley Creek-Russian River
Middle Russian River	Geyserville	Gill Creek-Russian River
Middle Russian River	Geyserville	Sausal Creek-Russian River
Middle Russian River	Geyserville	Franz Creek
Middle Russian River	Geyserville	Maacama Creek
Middle Russian River	Geyserville	Brooks Creek-Russian River
Middle Russian River	Warm Springs	Galloway Creek
Middle Russian River	Warm Springs	Soda Spring Creek-Dry Creek
Middle Russian River	Warm Springs	Warm Springs Creek
Middle Russian River	Warm Springs	Lake Sonoma-Dry Creek
Middle Russian River	Warm Springs	Pena Creek
Middle Russian River	Warm Springs	Mill Creek
Middle Russian River	Warm Springs	West Slough-Dry Creek
Middle Russian River	Laguna	Upper Laguna de Santa Rosa
Middle Russian River	Laguna	Lower Laguna De Santa Rosa

Middle Russian River	Santa Rosa	Upper Santa Rosa Creek
Middle Russian River	Santa Rosa	Lower Santa Rosa Creek
Middle Russian River	Mark West	Windsor Creek
Middle Russian River	Mark West	Porter Creek-Mark West Creek
Lower Russian River	Guerneville	East Austin Creek
Lower Russian River	Guerneville	Ward Creek-Austin Creek
Lower Russian River	Guerneville	Green Valley Creek
Lower Russian River	Guerneville	Porter Creek-Russian River
Lower Russian River	Guerneville	Dutch Bill Creek-Russian River
Lower Russian River	Guerneville	Willow Creek-Russian River

U.S. EPA's 2012 recommended recreational criteria uses enterococci as the sole indicator for both fresh and marine waters, or enterococci for marine waters and *E. coli* for freshwater. As stated in section 3.1 and discussed in section 3.2.3 of U.S. EPA's 2012 recommended recreational criteria document, "two microorganisms that have consistently performed well as indicators of illness in sewage-contaminated waters during epidemiological studies are enterococci in both marine and fresh water and *E. coli* in fresh water measured by culture." (U.S. EPA 2012, p. 9). Additionally, studies have shown that enterococci can exist and multiply in warm freshwater habitats creating false positives. Consequently, the statewide bacteria objectives in Part 3 of the ISWEBE Plan utilize only *E. coli* as the most reliable organism in freshwater. However, assessing data from both indicators for freshwater is not precluded by Part 3 of the ISWEBE Plan, if warranted under the situation-specific weight of evidence listing or delisting factors (sections 3.11 and 4.11 respectively of the Listing Policy). A peer reviewer of the Pathogen TMDL Action Plan recommended use of enterococci for freshwater in the Russian River watershed, based on epidemiological evidence of human health impact and its association with measured enterococci thresholds. Enterococci data were evaluated to determine attainment of REC-1 impairment when paired with further evidence in the form of public health advisories.

Multiple other thresholds were used to assess the sources of fecal waste and the risk of exposure to illness-causing pathogens. Human and bovine *Bacteroides* bacteria measurements were assessed to determine the presence of bacteria originating in the gut and uniquely associated with humans or bovine animals. Similarly, microbial source identification (e.g., PhyloChip™ phylogenetic DNA microarray) was also used to assess the percentage of bacteria DNA in any given sample that are associated with humans or grazers. Finally, public health advisories were assessed to identify those public

beaches with a risk of exposure to illness-causing bacteria, a risk that represents a direct adverse impact to the REC-1 beneficial use.

For the 2018 listing cycle, the Listing Policy was used to assess data quality and data quantity to determine impairment status of each HUC-12 subwatershed in the basin. A HUC-12 subwatershed was identified as impaired if: 1) data evaluated under section 3.3 of the Listing Policy exceeded the statewide bacteria objective for *E. coli* in freshwater or enterococci in saline water more than the allowable frequency; or 2) data evaluated under section 3.11 of the Listing Policy exceeded the U.S. EPA criteria for enterococci in freshwater more than the allowable frequency and there was a public health advisory anytime in the period of 2013 through 2018.

### ***Russian River Watershed Sampling Locations & Sources***

Sampling locations were established at multiple places throughout the watershed, as shown in Figure 5.

Water quality data were collected in approximately 50% of the HUC-12 subwatersheds, so the pollution and impairment status of unmeasured HUC-12 subwatersheds is unknown.

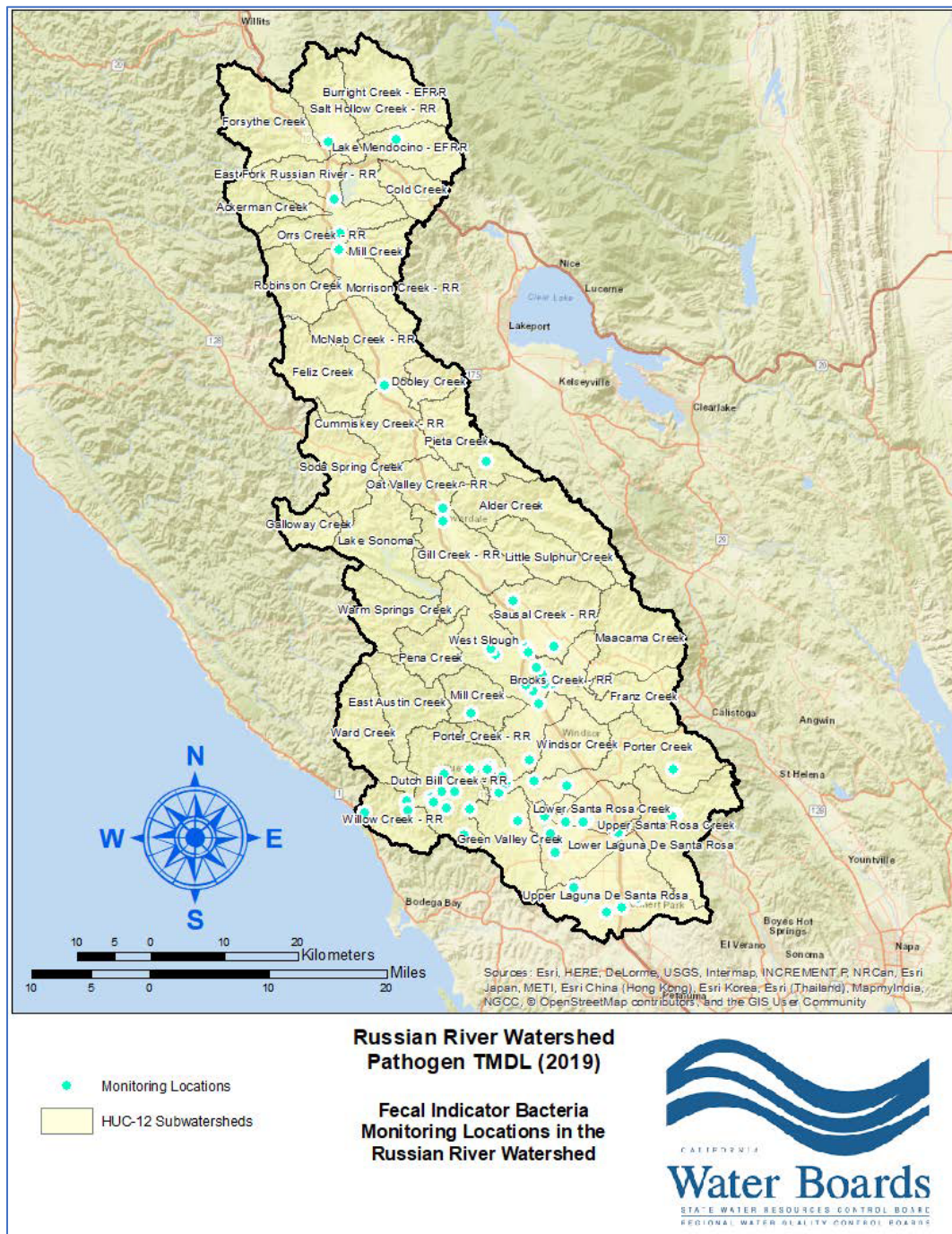
The source assessment summarized in the Pathogen TMDL Action Plan identifies all known sources of fecal waste discharge in the Russian River Watershed and describes special studies that identified associations between season, land cover category, and Onsite Wastewater Treatment System (OWTS) density with water quality outcomes, extending the area to which the Pathogen TMDL Action Plan applies to the whole watershed.

### ***Russian River Watershed Indicator Bacteria Impairments***

HUC-12 subwatersheds with direct evidence of pollution and impairment are listed in Table 7 and depicted in Figure 6. Impaired HUC-12 subwatersheds of the Russian River are also included in Table 7.



**Figure 5: Russian River Fecal Indicator Bacteria Monitoring Locations**

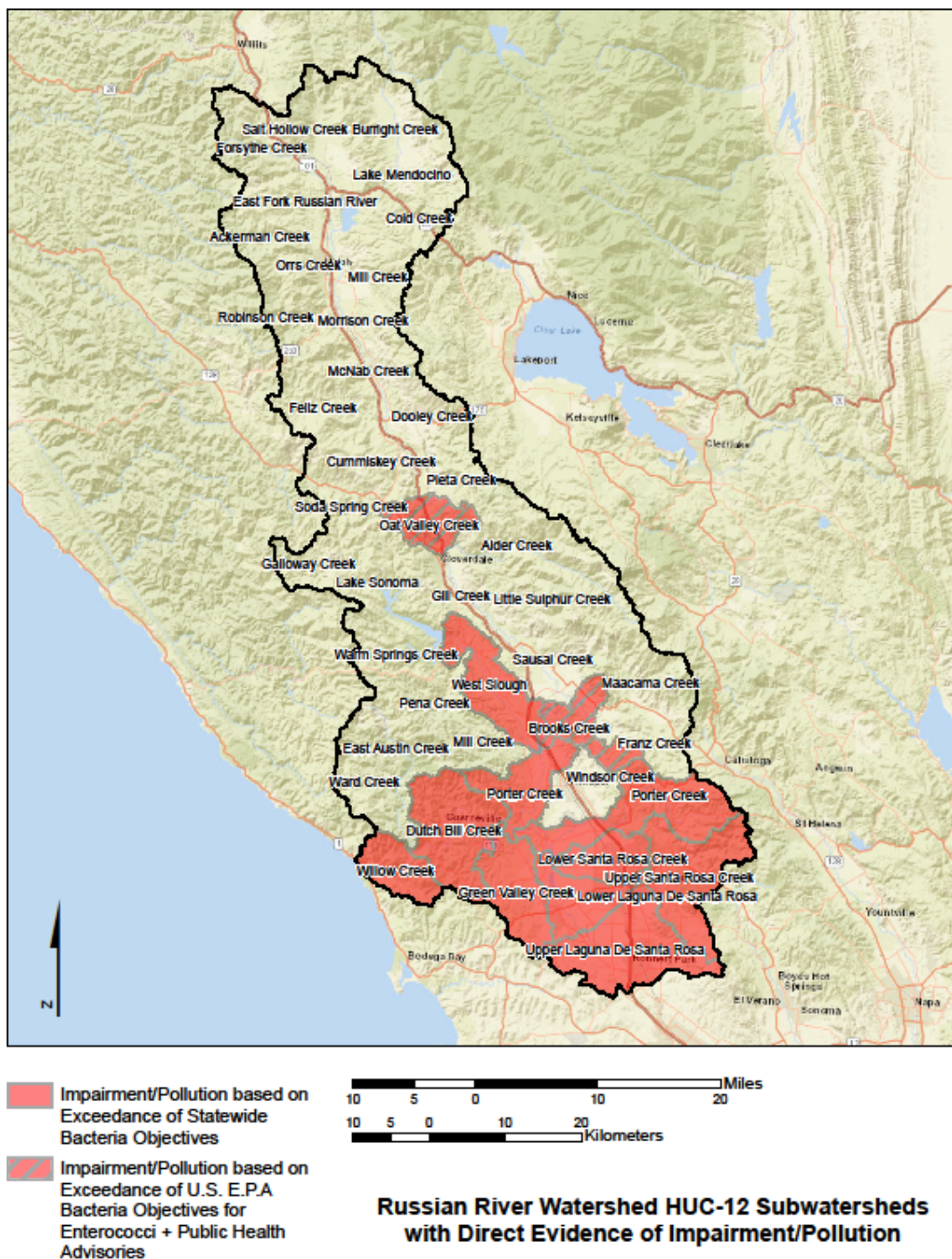


**Table 7: Russian River Impaired HUC-12 Subwatersheds**

<b>HUC-12 Subwatershed</b>	<b>Exceedance of <i>E. coli</i> Statewide bacteria objective</b>	<b>Exceedance of National Criteria for <i>enterococci</i></b>	<b>Public Health Advisories from 2013-2018</b>
Oat Valley Creek-Russian River subwatershed	No	Yes	Yes
Brooks Creek-Russian River subwatershed	No	Yes	Yes
West Slough-Dry Creek subwatershed	Yes	Yes	No
Upper Laguna de Santa Rosa subwatershed	Yes	Yes	No
Lower Laguna de Santa Rosa subwatershed	Yes	Yes	No
Upper Santa Rosa Creek subwatershed	Yes	Yes	Yes
Lower Santa Rosa Creek subwatershed	Yes	Yes	Yes
Porter Creek-Mark West Creek subwatershed	Yes	Yes	No
Green Valley Creek subwatershed	Yes	Yes	No
Porter Creek-Russian River subwatershed	Yes	Yes	Yes
Dutch Bill Creek-Russian River subwatershed	Yes	Yes	Yes
Willow Creek-Russian River subwatershed	Yes	No	No



**Figure 6: Russian River HUC-12 Subwatersheds with Direct Evidence of Bacteria Impairment/Pollution**



### 3.2. 303(d) List Recommendations for the North Coast Region

There are 42 new waterbody-pollutant combinations recommended for listing in the North Coast Region and one waterbody-pollutant combination is recommended for delisting.

An existing temperature listing decision for the Redwood Creek Hydrologic Unit is also being updated. Four of its tributaries are now meeting standards for temperature. As a result, the listing decision for the Redwood Creek watershed is being updated to reflect that the four tributaries are no longer impaired for temperature. These four tributaries are Little Lost Man Creek, Lost Man Creek, Prairie Creek, and Tom McDonald Creek (in 2012 the listing decision was similarly updated for Larry Dam Creek).

Table 8 through Table 14 below summarize the new proposed 303(d) listing and delisting recommendations for the North Coast Region for the 2018 listing cycle.

**Table 8: Elk River Watershed Delisting**

<b>Waterbody Hydrologic Unit</b>	<b>Waterbody Name</b>	<b>Delisting Extent</b>
Eureka Plain	Elk River Watershed, Upper Little South Fork Elk River	Entire waterbody

**Table 9: North Coast Temperature Decision Updates: Redwood Creek Hydrologic Unit - Decreased Temperature Listing Extent**

<b>Waterbody Name</b>	<b>Listings Extent</b>
Redwood Creek Hydrologic Area	Entire waterbody except Larry Dam Creek, Little Lost Man Creek, Lost Man Creek, Prairie Creek, and Tom McDonald Creek

**Table 10: North Coast Metals Listings**

<b>Waterbody Hydrologic Unit</b>	<b>Waterbody Name</b>	<b>Listings Extent</b>	<b>Pollutant</b>
Eel River	North Fork Eel River Hydrologic Area, Lower North Fork Eel River Watershed	Mainstem North Fork Eel	Aluminum
Eel River	Upper Main Eel River Hydrologic Area (includes Tomki Creek)	Mainstem Eel River	Aluminum

Eel River	Van Duzen River Hydrologic Area	Yager Creek	Aluminum
Eureka Plain	Elk River Watershed, Upper Elk River	Mainstem Elk River, South Fork Elk River, and North Fork Elk River	Aluminum
Eureka Plain	Freshwater Creek	Mainstem Freshwater Creek	Aluminum
Eureka Plain	Jacoby Creek Watershed	Mainstem Jacoby Creek	Aluminum
Redwood Creek	Redwood Creek	Mainstem Redwood Creek	Aluminum
Russian River	Middle Russian River Hydrologic Area, Geyserville Hydrologic Subarea	Mainstem Russian River	Aluminum
Russian River	Upper Russian River Hydrologic Area, Coyote Valley Hydrologic Subarea	Mainstem Russian River	Aluminum
Russian River	Upper Russian River Hydrologic Area, Ukiah Hydrologic Subarea	East Fork Russian River	Aluminum
Trinity River	Lower Trinity River Hydrologic Area	Mainstem Trinity River	Aluminum
Klamath River	Lost River Hydrologic Area, Tule Lake and Mt Dome Hydrologic Subareas	Entire waterbody	Arsenic
Trinity River	South Fork Trinity River Hydrologic Area	Mainstem South Fork Trinity River	Boron
Smith River	Delilah Creek	Entire waterbody	Copper
Smith River	Tilas Slough	Entire waterbody	Copper
Russian River	Middle Russian River Hydrologic Area, Santa Rosa Creek Hydrologic Subarea, mainstem Santa Rosa Creek	Entire waterbody	Manganese

Russian River	Upper Russian River Hydrologic Area, Ukiah Hydrologic Subarea	Mainstem Russian River and East Fork Russian River	Manganese
Eel River	Plaskett Lake	Entire waterbody	Mercury
Mendocino Coast	Navarro River Hydrologic Area	Mainstem Navarro River	Nickel

**Table 11: North Coast Ocean Beach Indicator Bacteria Listings**

<b>Waterbody Hydrologic Unit</b>	<b>Waterbody Name</b>	<b>Listings Extent</b>
Mendocino Coast	Greenwood State Beach	Entire waterbody
Mendocino Coast	MacKerricher State Park (near Mill Creek)	Entire waterbody
Mendocino Coast	Navarro River Beach	Entire waterbody
Mendocino Coast	Russian Gulch	Entire waterbody
Mendocino Coast	Van Damme State Park Beach	Entire waterbody

**Table 12: Russian River Hydrologic Unit (HU) Indicator Bacteria Listings**

<b>Waterbody Hydrologic Unit</b>	<b>Waterbody Name</b>	<b>Listings Extent</b>
Russian River	Lower Russian River Hydrologic Area, Guerneville Hydrologic Subarea	Porter Creek – Russian River HUC-12; Dutch Bill Creek – Russian River HUC-12; Willow Creek Russian River HUC-12

Russian River	Lower Russian River Hydrologic Area, Guerneville Hydrologic Subarea, Green Valley Creek watershed	Green Valley Creek HUC-12
Russian River	Middle Russian River Hydrologic Area, Geyserville Hydrologic Subarea	Oat Valley Creek – Russian River HUC-12; Brooks Creek – Russian River HUC-12
Russian River	Middle Russian River Hydrologic Area, Laguna Hydrologic Subarea, mainstem Laguna de Santa Rosa	Lower Laguna de Santa Rosa HUC-12; Upper Laguna de Santa Rosa HUC-12
Russian River	Middle Russian River Hydrologic Area, Laguna Hydrologic Subarea, tributaries to the Laguna de Santa Rosa (except Santa Rosa Creek and its tributaries)	Lower Laguna de Santa Rosa HUC-12; Upper Laguna de Santa Rosa HUC-12
Russian River	Middle Russian River Hydrologic Area, Mark West Hydrologic Subarea, mainstem Mark West Creek downstream of the confluence with the Laguna de Santa Rosa	Porter Creek – Mark West Creek HUC-12
Russian River	Middle Russian River Hydrologic Area, Mark West Hydrologic Subarea, mainstem Mark West Creek upstream of the confluence with the Laguna de Santa Rosa	Porter Creek – Mark West Creek HUC-12
Russian River	Middle Russian River Hydrologic Area, Mark West Hydrologic Subarea, tributaries to Mark West Creek (except Windsor Creek and its tributaries)	Porter Creek – Mark West Creek HUC-12
Russian River	Middle Russian River Hydrologic Area, Santa Rosa Creek Hydrologic Subarea, mainstem Santa Rosa Creek	Lower Santa Rosa Creek HUC-12; Upper Santa Rosa Creek HUC-12

Russian River	Middle Russian River Hydrologic Area, Santa Rosa Creek Hydrologic Subarea, tributaries to Santa Rosa Creek	Lower Santa Rosa Creek HUC-12; Upper Santa Rosa Creek HUC-12
Russian River	Middle Russian River Hydrologic Area, Warm Springs Hydrologic Subarea	West Slough – Dry Creek HUC-12

**Table 13: North Coast Conventional Pollutant Listings**

<b>Waterbody Hydrologic Unit</b>	<b>Waterbody Name</b>	<b>Listings Extent</b>	<b>Pollutant</b>
Eel River	North Fork Eel River Hydrologic Area, Lower North Fork Eel River Watershed	Mainstem North Fork Eel	pH
Eel River	North Fork Eel River Hydrologic Area, Lower North Fork Eel River Watershed	Asbill Creek	Dissolved Oxygen
Russian River	Lower Russian River Hydrologic Area, Austin Creek Hydrologic Subarea	Mainstem Austin Creek	Dissolved Oxygen
Smith River	Elk Creek	Entire waterbody	Dissolved Oxygen
Smith River	Martin Ranch Northwest (minor unnamed coastal stream)	Entire waterbody	Dissolved Oxygen
Russian River	Middle Russian River Hydrologic Area, Geyserville Hydrologic Subarea	Mainstem Russian River	Specific Conductivity

**Table 14: North Coast Total Dissolved Solids Listing**

<b>Waterbody Hydrologic Unit</b>	<b>Waterbody Name</b>	<b>Listings Extent</b>
Eel River	South Fork Eel River Hydrologic Area	Mainstem South Fork Eel River



### 3.3. North Coast TMDL Scheduling

TMDL projects are identified, assessed, and ranked during the North Coast Basin Plan triennial review process. The proposed ranking of projects identified during the triennial review is based on the factors required by the Listing Policy (described in Section 2.6, above) and consideration of several other factors, which are:

- Relevance to human health protection
- Relevance to threatened and endangered species protection
- Importance to the implementation of other Regional Water Board programs
- Stated priorities of the Regional Water Board, State Water Board, or the U.S. EPA
- Requests of stakeholders, including tribal governments, cities and counties, other state or federal agencies, non-governmental organizations, and individuals
- Availability of necessary expertise, funding, and other resources

For the purpose of the triennial review exercise, TMDL projects are ranked as the number 1 priority. Individual TMDL projects receive a sub-ranking of a, b, c, etc. A workplan is subsequently developed by assessing the amount of time each highly ranked project is estimated to take and the staff resources available during the next triennial period.

The current high priority TMDL projects are itemized in Table 15.

**Table 15: North Coast TMDL Schedule**

<b>TMDL Project</b>	<b>Projected Completion Date</b>
Russian River Pathogen TMDL Action Plan	2020
TMDL Program Retrospective Review of existing TMDLs, TMDL action plans, and TMDL implementation policies	2020
Ocean Beaches and Freshwater Streams Pathogen TMDL Action Plan	2021
Laguna de Santa Rosa Nutrient, Dissolved Oxygen, Temperature and Sediment TMDL Action Plan	2022

## 4. Regional Water Board 303(d) Recommendations and State Water Board Review

This section summarizes the Regional Water Boards 303(d) listings and 305(b) category updates, the requests for review of Regional Water Board listing decisions received by the State Water Board, State Water Board staff recommendations for the 303(d) list portion of the 2018 California Integrated Report and the 303(d) list for waterbodies in the North Coast Region, and the 305(b) category updates.

For the 2018 Integrated Report, the Regional Water Boards for the North Coast (Region 1), Lahontan (Region 6), and Colorado River Basin (Region 7) were “on-cycle” and assessed all readily available data received prior to the data solicitation cut-off date. In addition, the Regional Water Boards for the San Francisco Bay (Region 2), Los Angeles (Region 4), Central Valley (Region 5), and San Diego (Region 9) conducted “off-cycle” assessments of high priority waterbody/pollutant combinations.

Regional Water Boards 2, 4, 5, 6 and 7 approved their respective regional listing recommendations and submitted them to the State Water Board. As discussed in section 3, the State Water Board is administering the listing process for Region 1 consistent with Section 6.2 of the Listing Policy, and therefore there are no North Coast Regional Water Board approved listings or delistings. Region 9 assessed data for the 305(b) report and did not recommend any changes to the 303(d) list. Table 16 below summarizes Regional Water Board approved 303(d) listings and delistings for the 2018 California Integrated Report.

**Table 16: Number of 303(d) Listings and Delistings Approved by Regional Water Boards during the 2018 Listing Cycle**

Regional Water Board	Regional Water Board Approved New Listings	Regional Water Board Approved Delistings
2*	1	8
4*	None	8
5*	None	28
6	110	10
7	24	None
<b>TOTALS</b>	<b>140</b>	<b>54</b>

*\*Regions 2, 4, and 5 conducted “off-cycle” assessments for the 2018 listing cycle.*

State Water Board staff reviewed the fact sheets that were prepared by Regional Water Board staff. These fact sheets were reviewed for consistency with the Listing Policy and to ensure the use of sound scientific judgment. State Water Board staff also

evaluated statewide consistency regarding application of the Listing Policy. In addition, the State Water Board received eight letters with requests for review of 41 of the specific 303(d) list recommendations approved by the Regional Water Boards, per Section 6.2 of the Listing Policy.

Subsections 4.1 through 4.6 below summarize Regional Water Board recommendations and results of State Water Board staff review of Regional Board decisions and requests for review submitted pursuant to Section 6.2 of the Listing Policy. Additional detail and the rationale for the 303(d) listing/delisting decisions for the North Coast Region are documented in fact sheets (Appendix B). Additional detail and the rationale for all 303(d) listing/delisting decisions statewide are documented in Statewide Waterbody Fact Sheets (Appendix C).

Subsections 4.7 and 4.8 below summarize recommendations for the 303(d) list and 305(b) report respectively.

#### **4.1. San Francisco Bay Region (Region 2)**

The San Francisco Bay Regional Water Board conducted “off-cycle” assessments for the 2018 303(d) list. The Regional Water Board added one waterbody-pollutant combination and removed eight waterbody-pollutant combinations from the 2014/2016 303(d) list. The region also identified four waterbody-pollutant combinations for which TMDLs have been developed. The Regional Water Board approved delisting portions of the Napa River and Sonoma Creek for nutrients on February 12, 2014. The Regional Water Board approved delisting six beaches for indicator bacteria and listing Los Gatos Creek for temperature on March 13, 2019.

##### **4.1.1. Requests for Review**

Subsequent to the Regional Water Board approval, a request for review was received from the Santa Clara Valley Water District (“Valley Water”) for the temperature listing of Los Gatos Creek. Valley Water commented that the temperature thresholds used by the Regional Water Board were inappropriately applied to the waterbody. It pointed out that only temperature data from the summer and fall were assessed, and that data from the entire steelhead out-migration period should have been evaluated. It also stated that the temperature thresholds used by the region were developed for rivers in Washington and Oregon and therefore were not applicable to Los Gatos Creek which naturally would experience warmer temperatures. It also cited a study showing that steelhead can adapt to warmer temperatures. It indicated that the choice of guidelines and averaging periods can make a difference in whether or not a waterbody is determined to be impaired, and that if the region had chosen a higher threshold from the cited papers, and a different averaging period, the decision would have been not to list. Finally, it described an ongoing study in the larger Guadalupe River watershed to evaluate temperature and flow needs of resident steelhead and offered that the listing decision should wait until that study has been concluded.

State Water Board staff reviewed the Los Gatos Creek decision and the approach used by Regional Water Board staff to evaluate the temperature data. The Regional Water

Board applied four different scientifically valid temperature thresholds to evaluate both short-term (acute) and long term (chronic) effects of elevated temperature on steelhead. These thresholds were applied to data collected during the time periods and critical life stages (migration and rearing) when steelhead are present in the waterbody and most vulnerable to increased temperatures. The thresholds meet the requirements of section 6.1.3 of the Listing Policy for the selection of appropriate evaluation guidelines.

The multi-year study of flow and temperature in the larger Guadalupe River watershed being conducted by Valley Water (mentioned above) may provide a rationale for using different thresholds. As this study has not been completed, and may or may not result in different thresholds, it is premature to conclude that the thresholds utilized by the Regional Water Board are inappropriate. The Regional Water Board should continue to monitor the Guadalupe River study and consider its results, once completed.

The assessment approach utilized by the Regional Water Board was consistent with applicable requirements of the Listing Policy and based on sound scientific rationale. No changes to the Regional Water Board approved list are recommended.

#### **4.2. Los Angeles Region (Region 4)**

The Los Angeles Regional Water Board conducted “off-cycle” assessments for the 2018 Cycle. The region evaluated bacteria data collected at nine beaches in Ventura County that had been previously identified as impaired. The bacteria data were evaluated against the newly adopted statewide bacteria provisions for the water contact recreation (REC-1) beneficial use. Based on this evaluation, the region determined that the REC-1 beneficial use is supported in eight of the nine beaches. Data from one of the beaches indicated that the REC-1 beneficial use is impaired. Based on this assessment, staff proposed removing seven beaches, and not listing one beach, from the 2014/2016 303(d) list. The Regional Water Board approved the recommendation on March 14, 2019.

In reviewing the Regional Water Board listing recommendations, State Water Board staff confirmed that the REC-1 objective was not exceeded at the eight beaches. However, the eight beaches recommended for delisting by the Regional Board also have shellfish harvesting (SHELL) assigned as a beneficial use. The SHELL beneficial use protects areas where shellfish may be harvested for human consumption. The SHELL water quality objective is expressed as levels of total coliform (a type of bacteria), and the LOEs developed for seven of the eight beaches indicate that the shellfish beneficial use is impaired. The seven beaches partially support beneficial uses (support REC-1 but not SHELL), therefore, the State Water Board proposes to change the Regional Water Board’s delisting recommendations for the seven beaches to instead keep them on the 303(d) list as impaired for the SHELL use. See Table 17, below for a list indicating the Regional Water Board decision and results of State Board staff review of each beach.

The shellfish objective is currently under review by the Regional Water Board and will likely be updated. Once a new objective has been developed, the listing will be

reevaluated. Until that time, the Regional Water Board placed the 303(d) listings due to the SHELL use as low priority for TMDL development.

**Table 17: Los Angeles Water Board Approved Modifications to the 303(d) List and State Board Review**

Beach Name	Regional Board Decision	State Board Review
Peninsula Beach	Delist	Do not delist
Ormond Beach	Delist	Do not delist
Point Mugu Beach	Delist	Do not delist
Port Hueneme Beach Park	Delist	Do not delist
Rincon Parkway Beach	Delist	Do not delist
San Buenaventura Beach	Delist	Do not delist
Surfer's Point at Seaside (Seaside Park Beach)	Delist	Do not delist
Promenade Park Beach	Do not list	Do not list
Rincon Beach	Do not delist	Do not delist

#### 4.2.1. Requests for Review

No requests for review were submitted to the State Water Board for the Los Angeles Regional Water Board's proposed "off-cycle" assessments. No changes to the Regional Water Board approved list are recommended.

#### 4.3. Central Valley Region (Region 5)

The Central Valley Regional Water Board assessed readily available data to make "off-cycle" 303(d) listing recommendations. The Regional Board identified 41 existing 303(d) listings as having a TMDL developed for them. Another 22 listings were identified as being addressed by an action other than a TMDL. And 28 waterbody-pollutant combinations were removed from the 303(d) list due to attainment of water quality standards.

Following the public participation process, the Central Valley Water Board approved those recommendations on June 7, 2019.

#### **4.3.1. Requests for Review**

No requests for review were submitted to the State Water Board for the Central Valley Regional Water Board's proposed "off-cycle" assessments. No changes to the Regional Water Board approved list are recommended.

#### **4.4. Lahontan Region (Region 6)**

The Lahontan Regional Water Board conducted "on-cycle" assessments for the 2018 Cycle. The Regional Water Board assessed a total of 330 waterbody segments containing 3,964 waterbody-pollutant combinations. The Regional Water Board added 110 new waterbody-pollutant combinations and removed 10 waterbody-pollutant combinations from the 303(d) list. These recommendations were approved by the Regional Water Board on November 20, 2019.

##### **4.4.1. Requests for Review**

The State Water Board received three letters requesting review of 38 listing decisions approved by the Regional Water Board. The requested reviews were based on 303(d) listing decisions for indicator bacteria, mercury and nitrate.

#### ***Bacteria Listings***

A request for review from Centennial Livestock was received for 36 waterbodies that were listed based on the Lahontan Basin Plan objective for fecal coliform, though the Lahontan Board had added 37 waterbodies to the 303(d) list for fecal coliform. The Regional Water Board used the fecal coliform objective to assess attainment of the municipal drinking water (MUN) beneficial use. The requestor asserted that the regional fecal coliform objective was inappropriately associated with MUN, that it was incorrectly being used as a regionwide antidegradation standard, and that there was no requirement to list because the fecal coliform objective is currently being reevaluated by the Regional Water Board.

A request from Los Angeles Department of Water and Power (LADWP) was received for five waterbodies listed as impaired for indicator bacteria – fecal coliform and *E. coli*. LADWP asserted that the listings based on fecal coliform were inappropriate because the Lahontan Basin Plan objective for fecal coliform is currently being reevaluated and that it was used incorrectly to assess attainment of the MUN beneficial use. For Bishop Creek Forks (North and South), LADWP stated that Regional Water Board's calculations to evaluate the *E. coli* objective were inconsistent with the language in Part 3 of the ISWEBE Plan pertaining to assessment of the statewide bacteria objectives, because the geomean calculations were based on a minimum of three samples. For Horton Creek and Pine Creek, LADWP stated that the data assessed were not representative of the waterbody and that additional bacteria data exist that were not assessed by the Regional Water Board. Table 18 below lists the waterbodies requested for review with recommended listings based on the fecal coliform objective. Table 19 below, lists the waterbodies requested for review with recommended listings based on both the *E. coli* and fecal coliform objectives.

**Table 18: Lahontan Region Requests to Review Decisions to List based on Fecal Coliform/MUN Assessments**

<b>Waterbody Name</b>	<b>Centennial Livestock</b>	<b>LADWP</b>
Bishop B-1 Drain	Yes	Yes
Bishop Canal	Yes	No
Bishop Creek Canal	Yes	Yes
Carson River, East Fork	Yes	No
Cedar Creek	Yes	No
Convict Creek	Yes	No
East Tributary to Griff Creek	Yes	No
Hot Creek	Yes	No
Hot Creek (unknown tributary)	Yes	No
Horseshoe Meadow Creek	Yes	No
Jensen Slu (aka Brockman Slu)	Yes	No
Little Truckee River	Yes	No
Little Walker River	Yes	No
Lone Pine Creek	Yes	No
Long Valley Creek	Yes	No
Mammoth Creek (Old Mammoth Road to HWY 395)	Yes	No
Mid-branch Buckeye Creek	Yes	No
Milberry Creek	Yes	No
Mill Creek (trib. To West Walker River)	Yes	No
Owens River (Upper)	Yes	No
Reversed Creek	Yes	No

Round Valley Creek	Yes	No
Sardine Creek	Yes	No
Topaz Lake	Yes	No
Upper Truckee River (below Christmas Valley)	Yes	No
Susan River (Willard Creek to Susanville)	Yes	No
Susan River (Susanville to Honey Lake)	Yes	No
Virginia Creek	Yes	No
Wolf Creek	Yes	No

**Table 19: Lahontan Region Requests to Review Decisions to List based on E. coli/REC-1 and Fecal Coliform/MUN assessments**

<b>Waterbody Name</b>	<b>Centennial Livestock</b>	<b>LADWP</b>
Bishop Creek Forks (N & S Forks to bifurcation)	Yes	Yes
Bridgeport Reservoir	Yes	No
Griff Creek	Yes	No
Horton Creek	Yes	Yes
Hot Creek (Walker)	Yes	No
Markleeville Creek	Yes	No
Owens River (Long HA)	Yes	No
Pine Creek	Yes	Yes

State Water Board staff reviewed the aforementioned fecal coliform listing decisions. The Regional Water Board's fecal coliform objective is an applicable water quality objective in the Basin Plan and therefore it is appropriate to evaluate attainment of the MUN beneficial use. The objective is being evaluated by the Regional Water Board;



however, until a new objective is established, the fecal coliform objective remains an applicable objective in the Lahontan Basin Plan.

The Listing Policy requires the placement of waterbodies that do not meet standards on the 303(d) list of impaired waterbodies. The Water Boards are obligated to consider the information and thresholds currently available and to list where standards are exceeded. This is irrespective of whether or not the standard will be reevaluated at a future time or if the waterbody will be ranked as a lower priority for TMDL development.

The Regional Water Board's calculations of *E. coli* data conform to the requirements of the bacteria provisions in Part 3 of the ISWEBE Plan. It states in Section III.E.2 (emphasis added):

Only the GEOMETRIC MEAN values shall be applied based on a statistically sufficient number of samples, *which is generally not less than five samples* distributed over a six-week period.

The above language does not prohibit the Regional Water Board from using three samples to calculate the geomean. No evidence was presented indicating that geomeans calculated with three samples are not statistically sufficient and cannot be considered representative of conditions in the waterbodies.

The monitoring locations for the two waterbodies meet Listing Policy requirements for spatial representativeness. (See section 6.1.5 of the Listing Policy that grants the Water Board "wide discretion" to segment waterbodies.) Both watersheds have the same sources of bacteria; they share similar climate and hydrology, and the stream networks are connected by irrigation ditches. Although the downstream portion of one of the two watersheds runs through an urban area, overall the land uses are consistent. Although data from additional sampling locations would provide a more comprehensive picture of the waterbodies' condition, the data could not be assessed because it was not submitted prior to the data solicitation cut-off date. The Regional Water Board should assess the data "off-cycle" during the next Integrated Report Cycle.

### ***Mercury Listing***

LADWP also requested State Water Board review of the proposed 303(d) listing of Crowley Lake as impaired for mercury. The Regional Water Board applied the statewide mercury water quality objectives in Part 2 of the ISWEBE Plan and a weight of evidence approach to assess the mercury data and information. This resulted in a determination that the WILD beneficial use is impaired and a recommendation to add the lake to the 303(d) list. LADWP asserted that the evidence evaluated by the Regional Water Board did not support the decision to list the waterbody as impaired.

State Board staff reviewed the data and information and the weight of evidence approach applied by the Regional Water Board. The Regional Water Board followed the mercury assessment approach described in section 2.5.2 above and concluded, through the weight of evidence approach outlined in section 3.11 of the Listing Policy, that Crowley Lake is not meeting the mercury standard and therefore should be listed

as impaired on the 303(d) list. The listing decision conforms to Listing Policy requirements and no change is recommended.

### ***Nitrate Listing***

The Tahoe-Truckee Sanitation Agency (T-TSA) requested review of the 303(d) listing for nitrate on the Truckee River based on exceedances of site-specific objectives in the Lahontan Basin Plan. T-TSA stated that Regional Water Board's calculations were inconsistent with the method described in the Basin Plan. The nitrate objective is based on a mean of monthly means. The Regional Water Board calculated the mean of monthly means on an annual basis. T-TSA stated that the mean of monthly means should be calculated over the multi-year term of the existing waste discharge requirement, not on an annual basis.

State Water Board staff reviewed the calculations made by the Regional Water Board to evaluate the nitrate objective. Calculating the mean of monthly means on an annual basis is consistent with section 6.1.5.3 of the Listing Policy guidance on temporal representation.

No changes are recommended to the Lahontan Regional Water Board's approved list.

## **4.5. Colorado River Basin Region (Region 7)**

The Colorado River Basin Water Board was "on-cycle" in 2018 and assessed a total of 56 waterbody segments containing 2,204 waterbody-pollutant combinations. The Regional Water Board staff report identified 24 new waterbody-pollutant combinations for listing on the 303(d) list. These recommendations were approved by the Regional Water Board on November 14, 2019. One of the listings approved by the Regional Water Board pertains to a waterbody that is counted as two waterbody segments in the fact sheets. Therefore, the Regional Water Board approved a total of 25 recommended new listings.

In reviewing the Regional Water Board's listing recommendations, State Water Board staff identified that 7 of the listing recommendations proposed either wholly or partially apply to waterbodies located on tribal lands. To the extent those waters are on tribal land they are not subject to California's section 303(d) list. Therefore, the State Water Board recommends revising the decisions for these waterbodies to indicate that the impairment determination does not apply to tribal waters.

The Regional Water Board's staff report and fact sheets also identified 11 waterbodies assessed for multiple pollutants (a total of 25 waterbody-pollutant combinations) for which the fact sheets for these waterbody-pollutant combinations indicated non-attainment of water quality standards. The data for the waterbody-pollutant combinations were only preliminarily assessed and therefore the Regional Water Board did not adopt listing recommendations for them. However, the information indicates beneficial uses pertaining to the waterbody-pollutant combinations may be threatened. Therefore, the decisions for the 25 waterbody-pollutant combinations were revised to indicate that beneficial uses may be threatened and to place the waterbodies in

Category 3 of the Integrated Report if no other pollutant impairment exists in the waterbody. The State Water Board's expectation is that the Regional Water Board will complete its data assessments for the 25 waterbody-pollutant combinations off cycle during the combined 2020/2022 Integrated Report cycle.

#### **4.5.1. Requests for Review**

The Coachella Valley Water District sent a letter to the State Water Board requesting review of two Regional Water Board 303(d) listing decisions on segments of the Colorado River for manganese and turbidity. The Imperial Irrigation District, the Palo Verde Irrigation District, and the Desert Water Agency each sent letters requesting review of the same 303(d) listing decisions. The Colorado River segment between Imperial Reservoir and the California-Mexico border was recommended for listing for manganese. The Colorado River segment from Lake Havasu Dam to Imperial Dam was recommended for listing as impaired for turbidity.

Both of the 303(d) listings were based on the use of secondary maximum contaminant levels (SMCLs) as evaluation guidelines for the Basin Plan narrative water quality objective for aesthetic qualities for the MUN beneficial use. The requestors stated that SMCLs have not been adopted in the Colorado River Basin Plan and that using them as evaluation guidelines is inappropriate and violates the Listing Policy. They also state that the SCMLs are intended to address treated drinking water, not raw water. The requestors state that manganese can be removed through filtration and by law Colorado River water cannot be served to the public without filtration.

The requestors also stated that the Colorado River is naturally turbid, and that native biota are adapted to turbid conditions. Current management for Razorback Sucker and other native fish species includes high flow dam releases to increase sediment transport; and listing this portion of the Colorado River for turbidity may harm existing beneficial uses.

State Water Board staff reviewed the Regional Water Board approved listings for manganese and turbidity in the Colorado River and concluded that the manganese and turbidity SMCLs were applied appropriately, per section 6.1.3 of the Listing Policy, as evaluation guidelines to translate the narrative water quality objective for the MUN beneficial use.

With respect to the listing recommendations requested for State Water Board review, no changes are recommended to the Colorado River Basin Water Board's approved list.

#### **4.6. San Diego Region (Region 9)**

The San Diego Water Board chose to conduct "off-cycle" review by adding to their 305(b) list Category 1 waterbodies (waterbodies where at least one core beneficial use is supported and none are known to be impaired – see Figure 1). In addition, their Staff Report included information on waterbodies with existing 303(d) listings, but where there is also evidence that some beneficial uses are still supported. These were noted as waterbodies that are partially supporting beneficial uses. The recommendations are

based on biological assessment (bioassessment) data and information collected from rivers and streams in the region and submitted prior to the end of the data solicitation period for the 2018 listing cycle. A total of 29 waterbody segments and corresponding bioassessment index scores were evaluated for benthic community effects in the San Diego Region for placement into Category 1 or noted as partially supporting. Based on these assessments, the San Diego Water Board added 17 new waterbodies to Category 1 and identified 7 additional waterbodies as partially supporting beneficial uses as described above. No changes to the 303(d) list are necessary.

#### 4.6.1. Requests for Review

No requests for review were submitted to the State Water Board for the San Diego Regional Water Board's proposed "off-cycle" assessments.

Table 20 summarizes the reviews described in sections 4.1 to 4.6, above.

**Table 20: Summary Regional Water Board 303(d) Listing Recommendations Reviewed by State Water Board**

Region	Waterbody	Pollutant	Request for Review	Regional Water Board Decision	State Water Board Review
2	Los Gatos Creek	Temperature	Yes	List	List
4	Ventura Beaches	Bacteria	No	Delist	Do not delist
6	37 listing decisions	Indicator Bacteria (fecal coliform)	Yes	List	List
6	8 listing decisions	Indicator Bacteria ( <i>E. coli</i> )	Yes	List	List
6	Crowley Lake	Mercury	Yes	List	List
6	Truckee River	Nitrate	Yes	List	List
7	Colorado River	Manganese	Yes	List	List
7	Colorado River	Turbidity	Yes	List	List

#### 4.7. Recommended 303(d) List

State Water Board staff recommendations for the 303(d) list portion of the 2018 California Integrated Report and the 303(d) list for waterbodies in the North Coast Region are shown in Table 21, below. The second column lists the number of waterbody-pollutant combinations currently listed as impaired on the 303(d) list. The two subsequent columns contain a count of recommended new listings and recommended new delistings resulting from Regional Water Board assessments and State Water Board review. The last column includes the total number 303(d) listings for 2018 that would result if all State Water Board staff recommendations are approved.

**Table 21: Recommendations for the 303(d) List Portion of the 2018 California Integrated Report and the 303(d) List for Waterbodies in the North Coast Region**

Region	2014/2016 303(d) Listings	New Listings	Delistings	Total 2018 303(d) Listings
1	185	42	1	226
2	348	1	8	341
3	922	None	None	922
4	880	None	None	880
5	934	None	28	906
6	157	110	10	257
7	68	25	None	93
8	139	None	None	139
9	609	None	None	609
<b>TOTALS</b>	4,242	178	47	4,373

#### 4.8. 305(b) Integrated Report Condition Categories

For the 2018 listing cycle, a total of 2,666 waterbodies (containing 37,337 waterbody-pollutant combinations) were evaluated. See Table 22 and Table 23, for a summary of

the number of waterbodies both current and proposed in each of the five Integrated Report condition categories. Categories 1, 2, 3, and 4c are informational and do not require Water Boards approval. Waterbodies placed in those categories will be submitted as part of the 305(b) portion of the 2018 California Integrated Report to the U.S. EPA for their biennial report to Congress. Categories 4a, 4b, and 5 are the 303(d) list.

**Table 22: Count Waterbodies in 305(b) Integrated Report Condition Categories – Streams and Rivers**

<b>Integrated Report Condition Category</b>	<b>2014/16 Streams per Category</b>	<b>Proposed New Updates</b>	<b>2018 Sum of Current and Proposed New</b>
<b>1</b>	401	77	478
<b>2</b>	468	79	547
<b>3</b>	26	-18	8
<b>4A</b>	186	-3	183
<b>4B</b>	40	2	42
<b>4C</b>	None	None	None
<b>5</b>	828	52	880
<b>TOTAL</b>	1,949	189	2,138

*Count of current and proposed categorization of streams, rivers, and other linear surface waterbodies statewide.*

**Table 23: Count of Waterbodies in 305(b) Integrated Report Condition Categories – Lakes and Reservoirs**

<b>Integrated Report Condition Category</b>	<b>2014/16 Lakes &amp; Reservoirs per Category</b>	<b>Proposed New Updates</b>	<b>2018 Sum of Current + Proposed New</b>
<b>1</b>	37	-12	25
<b>2</b>	142	52	194
<b>3</b>	3	-2	1

<b>Integrated Report Condition Category</b>	<b>2014/16 Lakes &amp; Reservoirs per Category</b>	<b>Proposed New Updates</b>	<b>2018 Sum of Current + Proposed New</b>
<b>4A</b>	29	None	29
<b>4B</b>	6	None	6
<b>4C</b>	1	None	1
<b>5</b>	268	4	272
<b>TOTAL</b>	486	42	528

*Category assessments of lakes, reservoirs, and other non-linear surface waters statewide.*

## 5. Surface Water Ambient Monitoring Program

The Surface Water Ambient Monitoring Program (SWAMP) collects water quality samples throughout the state to evaluate water quality and ecosystem health. SWAMP data are assessed at the individual waterbody level during each Integrated Report cycle. However, SWAMP monitoring projects are also designed to evaluate conditions on a watershed, region, or statewide scale. Objective data and information generated by SWAMP statewide and regional monitoring and assessment efforts supports the foundation for informed and coherent decision-making to protect and restore water quality. This section provides an overview of the most recent findings from the SWAMP monitoring programs, including the Stream Pollution Trends (SPoT), Bioaccumulation, Bioassessment, Freshwater Harmful Algal Bloom and regional monitoring programs.

SPoT measures the long-term trends in stream contaminants and tests their biological effects to evaluate the impacts of changing land use at the watershed scale. Sediment samples are collected and analyzed for legacy and current-use pesticides, industrial compounds, and metals. Additionally, samples are tested for toxicity to resident aquatic organisms, specifically the amphipod *Hyaella azteca* and the midge *Chironomus dilutus*. Data collected since 2008 show that monitoring sites within urban land use have a higher prevalence of toxic samples, and that concentrations of pyrethroid pesticides continue to significantly increase, especially in relation to increasing urban land use. Information about long-term trends in stream contaminants and their impact on resident organisms illustrates the impacts of land development on water quality, helps prioritize waterbodies in need of water quality management, and evaluates the effectiveness of management programs designed to improve stream health.

The Bioaccumulation Monitoring Program generates data that is used to assess the impacts of contaminants in fish on beneficial uses in waterbodies statewide. Since 2015, contaminant data has been collected at select lakes where bass species are present as part of a long-term monitoring program to track status and trends in concentrations of mercury and other contaminants. Bass species (including largemouth, smallmouth, and others) are at the top of the food chain and consequently tend to accumulate high concentrations of mercury. The 2015 and 2017 data reports for long-term monitoring indicate a higher mean length-adjusted mercury concentration in lakes sampled in 2017 (0.45 ppm) than lakes sampled in 2015 (0.30 ppm); however, the difference was not statistically significant ( $p=0.075$ ) (Davis et al., 2019). As future rounds of bass lake monitoring are completed, annual means for length-adjusted mercury concentrations will provide a robust index of the statewide trend of bass lake mercury and will allow for the influence of hydrology and other factors to be examined.

In addition to data being used for waterbody assessments, data on fish contamination are used to inform OEHHA on developing consumption advisories for specific waterbodies or general advice for waterbodies across the state. These advisories serve to inform the public (specifically those who catch and eat fish from California's lakes) on how they can reduce their exposure to chemicals and maximize the benefits of fish consumption, by choosing locations and species with lower concentrations.



The Bioassessment Monitoring Program generates ecological data through its core monitoring programs, the Perennial Streams Assessment (PSA) and Reference Condition Monitoring Programs (RCMP). The PSA is an ongoing, long-term statewide probabilistic survey of the ecological condition of Wadeable streams and rivers throughout California that estimates ecological stream health by assessing biological indicators (benthic macroinvertebrates, algae), chemical constituents (nutrients, major ions, etc.) and habitat assessment in streams (both for in-stream and riparian corridor conditions).

The RCMP establishes and maintains a pool of monitoring sites with low levels of human activity in nearby and upstream watersheds (i.e., reference sites). This pool of reference sites is used to establish “reference conditions” for streams and rivers (Ode and Schiff 2009). Reference sites are an integral part of the bioassessment program and provide information necessary for: (1) setting objective and defensible benchmarks for attainment of ecological condition objectives, (2) accounting for natural variation in expected biological assemblages in different physical settings across the state, and (3) identifying high quality watersheds to prioritize protection efforts. RCMP data can also be used to help define physical habitat expectations and thus, help separate physical habitat impairment from other sources of impairment. Long term datasets at reference sites also provide an objective basis for monitoring the impacts of climate change on California’s aquatic resources (Bioassessment Quality Assurance Program Plan, 2019).

The Freshwater Harmful Algal Bloom (FHAB) program began in 2014. Since this time, the program has developed systems and infrastructure for sampling and tracking harmful algal bloom events, created informational resources for agency staff and the public, and collaborated with partners to establish voluntary guidance thresholds for public health signage postings. In 2016, the FHABs report tracking system was launched. The tracking system relies on voluntary reports of HAB incidents, which can be submitted online through the California Freshwater & Estuarine Harmful Algal Bloom Report Form. (<https://mywaterquality.ca.gov/habs/do/bloomreport.html>). A map of the reported HAB incidents throughout the state is available online at the HAB Incidents Reports Map. ([https://mywaterquality.ca.gov/habs/where/freshwater\\_events.html](https://mywaterquality.ca.gov/habs/where/freshwater_events.html)).

The FHAB Program has observed in recent years that FHABs are increasing in incidence, duration, and toxicity statewide and as a result, human, domestic animal (particularly dogs and livestock) and wildlife health impacts are increasingly prevalent. The temporal occurrence of FHABs is also increasing from predominantly summer blooms to year-round blooms in some areas. As the infrastructure and resources for bloom responses have become more developed and comprehensive, the program is currently focusing efforts on development of a statewide strategy for routine monitoring of FHABs.

More information about the SWAMP statewide and regional programs is available at Surface Water Ambient Monitoring Program website. ([https://www.waterboards.ca.gov/water\\_issues/programs/swamp/](https://www.waterboards.ca.gov/water_issues/programs/swamp/)). Information about SWAMP and other water quality and ecosystem data can be found in the annual Water Quality Status Reports. ([https://www.waterboards.ca.gov/resources/data\\_databases/wq\\_status\\_report.html](https://www.waterboards.ca.gov/resources/data_databases/wq_status_report.html)).

See also the Water Quality Status Report's annual snapshot of the Water Board's water quality and ecosystem data, including data generated by the SWAMP programs highlighted above:

## 6. References

*For a complete list of references (data, QAPPs, evaluation guidelines, etc.) used in all the Waterbody Fact Sheets, see Appendix H.*

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