

# SALTON SEA MIP ANNUAL WORK PLAN

## 2024

Prepared for  
California Natural Resources Agency,  
California Department of Water Resources, and  
California Department of Fish and Wildlife

February 2024





# SALTON SEA MIP ANNUAL WORK PLAN

## 2024

Prepared for  
California Natural Resources Agency,  
California Department of Water Resources, and  
California Department of Fish and Wildlife

February 2024



# CONTENTS

## Salton Sea MIP Annual Work Plan

	<u>Page</u>
<b>Acronyms and Other Abbreviations .....</b>	<b>iii</b>
<b>Chapter 1, Introduction .....</b>	<b>1-1</b>
1.1 Background.....	1-1
1.2 MIP Work Plan.....	1-1
1.3 Implementing Partners.....	1-2
<b>Chapter 2, 2024 Monitoring Elements.....</b>	<b>2-1</b>
2.1 Status and Trends Monitoring.....	2-1
2.1.1 Surface Water Hydrology .....	2-1
2.1.2 Salton Sea Water Quality Monitoring.....	2-6
2.1.3 CVWD Agricultural Drain Monitoring .....	2-6
2.1.4 Salton Sea Environmental Timeseries – Water Quality and Air Quality.....	2-6
2.1.5 Meteorology and Air Quality Monitoring.....	2-7
2.1.6 Shoreline Waterbird Surveys – Tri-annual.....	2-9
2.1.7 Shoreline Waterbird Surveys - Monthly .....	2-10
2.1.8 Shoreline Waterbird Surveys - Weekly.....	2-10
2.1.9 Marshbird Callback Surveys – Restoration Sites .....	2-11
2.1.10 Marshbird Callback Surveys – SBSSNWR.....	2-11
2.1.11 Wintering Waterfowl Aerial Surveys .....	2-11
2.1.12 Nesting Seabirds Surveys.....	2-11
2.1.13 Evening Sandhill Crane Roost Surveys.....	2-12
2.1.14 Salton Sea Fish Survey .....	2-12
2.1.15 Desert Pupfish Survey.....	2-12
2.1.16 Salton Sea Management Program and Community Engagement Committee .....	2-13
2.1.17 Salton Sea Management Program Engagement Opportunities and Outreach.....	2-13
2.1.18 Salton Sea Management Program and Community Needs .....	2-14
2.2 Focused Studies.....	2-14
2.2.1 Surface Water and Groundwater Budgets .....	2-14
2.2.2 Spatial and Temporal Patterns and Controls on Water-Column Redox and Temperature Structures in the Salton Sea .....	2-15
2.2.3 Sulfur Cycling in the Salton Sea Water Column and Sediments.....	2-15
2.2.4 Nutrient Sources, Sinks, and Cycles in the Salton Sea.....	2-15
2.2.5 Selenium Cycling and Bioaccumulation in Foodwebs in Salton Sea Wetlands.....	2-15
2.2.6 Selenium Concentrations in Yuma Ridgway’s Rails and Prey .....	2-16
2.2.7 Trace Metal Patterns and Controls in the Sediments of the Salton Sea .....	2-17
2.2.8 Patterns of Pesticide Enrichment in Salton Sea Sediments.....	2-17

	<u>Page</u>
2.2.9 Lithium Measurements in Sediments and Surface Water.....	2-17
2.2.10 Salton Sea Coastal Zone Soil Survey .....	2-17
2.2.11 Microbially and Enzyme-Induced Calcite Precipitation for Mitigation of Fugitive Dust.....	2-18
2.2.12 Aerosolized Toxins around the Salton Sea .....	2-18
2.2.13 Public Health Impacts from Salton Sea Playa Dust.....	2-18
2.2.14 Low-Cost Ambient Air Quality Network Development.....	2-19
2.2.15 Indoor Air Quality and Filtration Study.....	2-19
2.2.16 Salton Sea Air Quality Assessment .....	2-19
2.2.17 Yuma Ridgway’s Rail Movements and Migration Behavior.....	2-20
2.2.18 Microbial Ecology: Patterns of Lateral and Vertical Variability and Controls .....	2-20
2.3 Effectiveness Monitoring.....	2-20
2.3.1 Salton Sea Management Program Species Conservation Habitat Project .....	2-20
2.3.2 Salton Sea Management Program Dust Suppression Project Monitoring.....	2-21
2.3.3 Salton Sea Air Quality Mitigation Program.....	2-21
<b>Chapter 3, Discussion.....</b>	<b>3-1</b>
3.1 Data Needs and Opportunities.....	3-1
3.2 Future Annual Work Plans and Reporting .....	3-1
<b>Chapter 4.....</b>	<b>4-1</b>
<b>References .....</b>	<b>4-1</b>

**Tables**

Table 2-1 2024 Monitoring and Studies at the Salton Sea .....	2-2
Table 2-2 Salton Sea Air Basin Air Quality Monitoring Sites.....	2-7
Table 2-3 Salton Sea Air Basin Air Quality Monitoring Metrics and Methods .....	2-9
Table 3-1 2024 Monitoring and Studies Compared with MIP Priorities.....	3-2

# Acronyms and Other Abbreviations

<b>Acronym or Abbreviation</b>	<b>Definition</b>
Alianza	Alianza Coachella Valley
BAM	Beta Attenuation Monitor
BLM	Bureau of Land Management
BWG	Better World Group Advisors
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CNRA	California Natural Resources Agency
CPUE	Catch per Unit Effort
CVWD	Coachella Valley Water District
RWQCB	Colorado River Basin Regional Water Quality Control Board
DWR	Department of Water Resources
EC	electrical conductivity
ICAPCD	Imperial County Air Pollution Control District
IID	Imperial Irrigation District
LLU	Loma Linda University
MIP	Monitoring Implementation Plan
NWIS	National Water Information System
OBO	Oasis Bird Observatory
PBCS	Point Blue Conservation Science
SSMP	Salton Sea Management Program
Work Plan	Salton Sea MIP Annual Work Plan
MIP	Salton Sea Monitoring Implementation Plan
South Coast AQMD	South Coast Air Quality Management District
SCH Project	Species Conservation Habitat Project
SCADA	Supervisory Control and Data Acquisition
SBSNWR	Sonny Bono Salton Sea National Wildlife Refuge
TEOM	tapered element oscillating microbalance
TDS	total dissolved solids
TSS	total suspended solids
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture

<b>Acronym or Abbreviation</b>	<b>Definition</b>
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UCR	University of California Riverside



# CHAPTER 1

---

## Introduction

### 1.1 Background

The California Natural Resources Agency (CNRA), the California Department of Water Resources (DWR), and the California Department of Fish and Wildlife (CDFW) are implementing the Salton Sea Management Program (SSMP) to address air quality and ecological threats at the Salton Sea. The SSMP has a plan for action over the 10-year period from 2018 to 2028 (Phase 1: 10-Year Plan), which aims to improve conditions around the Salton Sea by constructing projects that create habitat and reduce dust from the exposed lakebed on 30,000 acres. Since the state is not a significant landowner in the area, collaboration with land-owning entities is essential and a top priority for the SSMP. The SSMP team also recognizes the crucial role of partnerships in meeting restoration goals through collecting data, facilitating project implementation, and helping obtain funding sources.

The Salton Sea Monitoring Implementation Plan (MIP) is a regional-scale monitoring plan for the Salton Sea ecosystem (CNRA 2022). The MIP, which was developed with input from implementing partners (agencies, non-governmental organizations, universities, and other research partners) and the SSMP Science Committee, describes recommended monitoring activities to measure conditions of water, air quality, land cover, biological resources, and socioeconomics. The MIP prioritized indicators and metrics and summarized methods and sampling regimes. These indicators were prioritized based on their informativeness and relationship to key resources and drivers of the Salton Sea ecosystem, feasibility of measurement, and relevance for management actions. Some indicators were recommended only for focused study to inform a specific management-articulated information need or specifically identified data gap.

### 1.2 MIP Work Plan

The Salton Sea MIP Annual Work Plan (Work Plan) tiers off the MIP and reflects the annually planned work done by implementing partners that needs to be conducted within the Salton Sea ecosystem during the calendar year. The Work Plan is intended to promote collaborative science and monitoring to leverage the collective expertise and investments of partner agencies and the larger science community. The Work Plan includes monitoring and research that supports the SSMP's vision for delivering dust suppression and habitat projects during Phase 1 and informs long-range planning beyond Phase 1. This includes baseline status and trends monitoring, effectiveness monitoring, and focused studies.

## 1.3 Implementing Partners

Regional implementing partners were contacted in 2023 to inventory activities planned for 2024 (respondents italicized):

- 29 Palms Band and Cabazon Band of Mission Indians (29 Palms/Cabazon)
- *Alianza Coachella Valley (Alianza)*
- Arizona State University (ASU)
- California Air Resources Board (CARB)
- *California Department of Fish and Wildlife (CDFW)*
- *California Department of Water Resources (DWR)*
- *California Department of Natural Resources (CNRA)*
- *Coachella Valley Water District (CVWD)*
- *Colorado River Basin Regional Water Quality Control Board (Colorado River Basin RWQCB)*
- Comite Civico del Valle
- Desert Research Institute
- *Imperial County Air Pollution Control District (ICAPCD)*
- *Imperial Irrigation District (IID)*
- *Loma Linda University*
- *National Audubon Society (Audubon California)*
- *Oasis Bird Observatory (OBO)*
- *Pacific Institute*
- *Point Blue Conservation Science (PBCS)*
- Salton Sea Authority
- *San Diego State University (SDSU)*
- *South Coast Air Quality Management District (South Coast AQMD)*
- Torres Martinez Desert Cahuilla Indians (Torres Martinez)
- *U.S. Bureau of Reclamation (USBR)*
- *U.S. Department of Agriculture-Natural Resource Conservation Service (USDA-NRCS)*
- *U.S. Fish and Wildlife Service (USFWS)*
- *U.S. Geological Survey (USGS)*
- *University of Idaho (U. Idaho)*
- *University of California Riverside (UCR)*

# CHAPTER 2

---

## 2024 Monitoring Elements

The monitoring activities and studies (monitoring elements) that were voluntarily reported by partners are summarized in **Table 2-1**. This Work Plan may not reflect all monitoring, studies, research, and synthesis work occurring in the Salton Sea region. Effectiveness monitoring to determine project performance and metrics such as air quality monitoring are included. Compliance monitoring, such as biological surveys in conjunction with as-needed construction monitoring or maintenance of drainage channels, is not discussed. Information about the timing of data collection or sampling (e.g., months, frequency, and duration) was noted if it was provided.

### 2.1 Status and Trends Monitoring

#### 2.1.1 Surface Water Hydrology

Implementing Partner: USGS.

Description: Gaging stations to measure river discharge (cubic feet per second), river stage (feet), and elevation (lake).

Location: River discharge (cubic feet per second ([cfs]) to the Salton Sea and gage height (feet) are measured at the Whitewater River (Station 10259540, Whitewater River near Mecca), Alamo River (Station 10254730, Alamo River near Niland), and New River (Station 10255550, near Westmorland). Water surface elevation of the Salton Sea is measured on the southwest shore (Station 10254005, Salton Sea near Westmorland).

Timing: Daily.

Notes: Data is available from the USGS National Water Information System website (<https://waterdata.usgs.gov/nwis/sw>).

**TABLE 2-1  
2024 MONITORING AND STUDIES AT THE SALTON SEA**

Section	Title	Implementing Partner(s) <sup>1</sup>	Indicator	Timing of Data Collection <sup>2</sup>	Location
<b>Status and Trends</b>					
2.1.1	Surface Water Hydrology	USGS	Hydrology (discharge, elevation)	Daily	Rivers (Whitewater, Alamo, New), Salton Sea near Westmorland
2.1.2	Salton Sea Water Quality Monitoring	CDFW, Colorado River Basin RWQCB	Water quality (basic, contaminants, nutrients)	Quarterly	3 northern and 2 southern sites within the Salton Sea
2.1.3	CVWD Agricultural Drain Monitoring	CVWD	Hydrology (discharge), water quality (basic)	Discharge: Monthly Water quality: Biannual (Feb, Aug)	North Salton Sea drains
2.1.4	Salton Sea Environmental Timeseries	Alianza, LLU	Water quality, air quality	Water quality: Feb, Apr (northwest Salton Sea); Feb, May, Jun, Sep, Dec (inflow river) Air quality: continuous	Northwest Salton Sea near Whitewater River inflow
2.1.5	Meteorology and Air Quality	South Coast AQMD, ICAPCD, IID, TM, 29 Palms/Cabazon	Air quality	Continuous	Dust control areas, shoreline, playa
2.1.6	Shoreline Waterbird Surveys – Tri-annual	PBCS, Audubon CA, OBO, CDFW, USFWS	Birds	Seasonally (Apr, Aug, Dec)	Entire shoreline
2.1.7	Shoreline Waterbird Survey – Monthly	Audubon CA	Birds	Monthly	Entire shoreline
2.1.8	Shoreline Waterbird Surveys – Weekly	OBO	Birds	Weekly and Monthly	North Sea shoreline (between Desert Shores and Salt Creek)
2.1.9	Marshbird Callback Surveys – Restoration Sites	CDFW, Audubon CA	Birds	Annually	Surveys at Salton Sea North Lake and Torrez-Martinez area to the west as well as Bombay Beach – Audubon wetland project.
2.1.10	Marshbird Callback Surveys – SBSSNWR	USFWS SBSSNWR	Birds	Annually March-May	South end of Salton Sea on SBSSNWR refuge land and adjacent unmanaged marshes.

Section	Title	Implementing Partner(s) <sup>1</sup>	Indicator	Timing of Data Collection <sup>2</sup>	Location
2.1.11	Wintering Waterfowl Aerial Surveys	USFWS, CDFW	Birds	Annually mid-winter	Imperial Valley and Salton Sea
2.1.12	Nesting Seabird Surveys	USFWS	Birds	Biweekly April-August	Southern shoreline of Salton Sea
2.1.13	Evening Sandhill Crane Roost Surveys	USFWS	Birds	Monthly: September-February	Throughout Imperial Valley
2.1.14	Salton Sea Fish Survey	CDFW	Aquatic (fish)	Fall	Sea
2.1.15	Desert Pupfish Survey	CDFW	Aquatic (pupfish)	March/April to October	CCVD and IID agricultural drains, Salt Creek, Varner Harbor.
2.2.16	SSMP and Community Engagement Committee	SSMP	Public Engagement	Meetings throughout the year	Virtual meetings
2.2.17	SSMP Engagement Opportunities and Outreach	SSMP	Public Engagement	Meetings throughout the year	Virtual and in-person in communities around the Salton Sea
2.2.18	SSMP and Community Needs	CNRA	Public input	Surveys and meetings conducted in 2023.	Communities around Salton Sea
<b>Focused Studies</b>					
2.2.1	Surface Water and Groundwater Budgets	USBR, USGS	Hydrology (groundwater)	-	Salton Sea HUC6 watershed, with more detail in the northern region
2.2.2	Spatial and Temporal Patterns and Controls on Water-Column Redox and Temperature Structures in the Salton Sea	UCR	Water quality (oxygen, sulfur)	-	Entire Salton Sea basin (shallow and deep water)
2.2.3	Sulfur Cycling in the Salton Sea Water Column and Sediments	UCR	Water quality (sulfur)	-	Entire Salton Sea basin (shallow and deep water)
2.2.4	Nutrient Sources, Sinks, and Cycles in the Salton Sea	UCR	Water quality (nutrients)	-	Entire Salton Sea basin (shallow and deep water)
2.2.5	Selenium Cycling and Bioaccumulation in Foodwebs in Salton Sea Wetlands	USGS	Water quality, detritus, primary producers, invertebrates, fish (selenium, isotopes, genetics)	March and April	Wetlands at the southern Salton Sea (managed and emerging wetlands)

2. 2024 Monitoring Elements

Section	Title	Implementing Partner(s) <sup>1</sup>	Indicator	Timing of Data Collection <sup>2</sup>	Location
2.2.6	Selenium Concentrations in Yuma Ridgway's Rails and Prey	USGS, USFWS, U. Idaho	Water quality, Birds (selenium in Yuma Ridgway's rails and prey)	March-May 2024	Marshes around Salton Sea
2.2.7	Trace Metal Patterns and Controls in the Sediments of the Salton Sea	UCR	Water quality (metals)	-	Entire Salton Sea basin (shallow and deep water)
2.2.8	Patterns of Pesticide Enrichment in Salton Sea Sediments	UCR, SDSU	Water quality (pesticides)	-	Entire Salton Sea basin (shallow and deep water)
2.2.9	Lithium Measurements in Sediments and Surface Water	UCR	Water quality (lithium)	2024: Quarter 1	Salton Sea near river inflows
2.2.10	Salton Sea Coastal Zone Soil Survey	USDA NRCS, BLM, IID	Soils	2024	Entire shoreline
2.2.11	Microbially and Enzyme-Induced Calcite Precipitation for Mitigation of Fugitive Dust	USBR, ASU, IID	Soils (biocrust)	Fall 2024	Near Salton City
2.2.12	Aerosolized Toxins around the Salton Sea	UCR	Air quality (particulates, toxin)	-	Coachella and Imperial Valleys
2.2.13	Public Health Impacts from Salton Sea Playa Dust	UCR	Air quality (playa dust), Health	Ongoing until Spring 2026	Coachella and Imperial Valleys
2.2.14	Low-Cost Ambient Air Quality Network Development	UCR	Air quality	-	Coachella and Imperial Valleys
2.2.15	Indoor Air Quality and Filtration Study	UCR	Air quality	Summer 2023-Summer 2024	Coachella and Imperial Valleys
2.2.16	Salton Sea Air Quality Assessment	Pacific Institute	Air quality	-	Salton Sea and surrounding areas
2.2.17	Yuma Ridgway's Rail Movements and Migration Behavior	U. Idaho, USGS	Birds (Yuma Ridgway's rail)	Deploy GPS transmitters March-May 2024. Location data collected through 2024.	Marshes around the Salton Sea and in Arizona along the Lower Colorado River
2.2.18	Microbial Ecology: Patterns of Lateral and Vertical Variability and Controls	UCR	Aquatic (microbes)	-	Entire basin (shallow and deep water)

Section	Title	Implementing Partner(s) <sup>1</sup>	Indicator	Timing of Data Collection <sup>2</sup>	Location
<b>Effectiveness Monitoring</b>					
2.3.1	SSMP Species Conservation Habitat Project	DWR, CDFW, Colorado River Basin RWQCB	Water quality (basic, selenium)	Quarterly	SCH Project near New River (interception ditch, ponds, water supply)
2.3.2	SSMP Dust Suppression Project Monitoring	DWR	Air quality (particulates)	Continuous	SSMP dust suppression projects (Clubhouse, Tule Wash, West Bombay Beach)
2.3.3	Salton Sea Air Quality Mitigation Program	IID	Air quality (particulates)	Continuous	IID dust suppression project areas (southern shoreline, playa)

## NOTES:

1 Abbreviations: 29 Palms/Cabazon = 29 Palms Band and Cabazon Band of Mission Indians; Alianza = Alianza Coachella Valley; Audubon CA = National Audubon Society; BLM = Bureau of Land Management; CDFW= California Department of Fish and Wildlife; CNRA = California Natural Resources Agency; CVWD = Coachella Valley Water District; DWR = Department of Water Resources; ICAPCD = Imperial County Air Pollution Control District; IID = Imperial Irrigation District; LLU = Loma Linda University; OBO = Oasis Bird Observatory; PBCS = Point Blue Conservation Science; Colorado River Basin RWQCB = Colorado River Basin Regional Water Quality Control Board; South Coast AQMD = South Coast Air Quality Management District; SDSU = San Diego State University; SSMP = Salton Sea Management Program; TM = Torres Martinez Desert Cahuilla Indians; U. Arizona = University of Arizona; UCR = University of California Riverside; U. Idaho = University of Idaho; USBR = U.S. Bureau of Reclamation; USDA-NRCS = U.S. Department of Agriculture Natural Resources Conservation Service; USFWS SBSSNWR = U.S. Fish and Wildlife Service Sonny Bono Salton Sea National Wildlife Refuge, USGS= U.S. Geological Survey

2 - = timing or location of data collection not specified by respondent, or using existing data.

## 2.1.2 Salton Sea Water Quality Monitoring

Implementing Partners: CDFW and Colorado River Basin RWQCB.

Description: Water samples are collected for lab analysis to measure nitrate, phosphorus, total nitrogen, ammonia, organochlorine pesticides, organophosphate pesticides, pyrethroids, sulfide, sulfate, enterococcus, chloride, sodium, mercury, metals, total dissolved solids (TDS), and total suspended solids (TSS) are collected quarterly. Salinity is collected annually.

Location: Three southern sea sites, two northern sea sites.

Timing: Quarterly events occur in February, April, August, and October.

Notes: Salton Sea monitoring is difficult due to the lack of boat access as the shoreline recedes. One monitoring location in the southern sea was relocated due to receding shoreline. Access issues may improve in 2024 but will remain challenging. The two northern sea sites will be sampled if boat launching access in the northern part of the sea is improved in 2024. The northern sea sites are not currently sampled.

## 2.1.3 CVWD Agricultural Drain Monitoring

Implementing Partner: CVWD.

Description: The CVWD maintains a system of 25 agricultural drains at the northern Salton Sea, which drain into the Salton Sea around the Whitewater River. Flow (discharge) from CVWD agricultural drains is measured using a SonTek FlowTracker 2 handheld velocimeter instrument or dedicated flowmeter. Temperature, field pH, and field electrical conductivity are measured bi-annually using the handheld Hach HQ2200 multi-parameter instrument, and the TDS and nutrient samples are collected annually.

Location: CVWD direct drains that discharge to the north Salton Sea.

Timing: Monthly discharge measurements; biannual (February and April) water quality measurements of temperature, field electrical conductivity, and field pH; and annual (August) water sample collection of nutrients and TDS.

Notes: This monitoring is in association with ongoing operations and maintenance.

## 2.1.4 Salton Sea Environmental Timeseries – Water Quality and Air Quality

Implementing Partner: Alianza Coachella Valley, Loma Linda University (Ryan Sinclair).

Description: This monitoring program is a community science project in the northwest Salton Sea to simultaneously measure air quality and water quality. An Aeroqual sensor (AQS1 Gas Sentry Pro) was deployed in August 2023 to measure hydrogen sulfide (H<sub>2</sub>S), volatile organic compounds (VOC), and nitrogen dioxide (NO<sub>2</sub>). Basic water quality metrics (temperature,



dissolved oxygen, pH, specific conductivity, chlorophyll a, phycoerythrin, and turbidity) are measured using a YSI ProDSS sonde. Nutrients (nitrate, ammonia, phosphate, sulphate, and sulfide) are measured using a YSI 6500 Photometer.

**Location:** Northwest Salton Sea about 2 miles off the northwestern shore near the Whitewater River. Five sample points along a “T” shaped transect extending 3 km south of the Whitewater River.

**Timing:** Water quality monitoring occurred six times in 2023 (February 4, April 1, June 3, August 18, October 7, and December 9). In 2024, basic water quality and nutrients will be measured twice (February and April) in the northwest Salton Sea. Monitoring of inflowing river water will occur five times (February, May, June, September, and December). Air quality monitoring is ongoing with the Aeroqual monitor that measures H<sub>2</sub>S, VOC, and NO<sub>2</sub>.

**Notes:** The air monitor posts data in real time and is viewable on <https://saltonseascience.org/>

## 2.1.5 Meteorology and Air Quality Monitoring

**Implementing Partners:** South Coast AQMD and the ICAPCD operate regulatory monitoring equipment around the Salton Sea. The IID Salton Sea Air Quality Mitigation Program maintains a non-regulatory monitoring network. Other monitoring stations are maintained by the Torres Martinez Desert Cahuilla Indians, the Twenty-Nine Palms Band of Mission Indians, and the Cabazon Band of Mission Indians.

**Description:** Real-time monitoring focuses on common air pollutants of concern, mainly particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>), hydrogen sulfide (H<sub>2</sub>S), and ozone (O<sub>3</sub>). Monitoring sites and parameters measured are summarized in **Table 2-2**, as cataloged by the California Air Resources Board (CARB). The general methods are listed in **Table 2-3** for each parameter.

**TABLE 2-2**  
**SALTON SEA AIR BASIN AIR QUALITY MONITORING SITES**

County	CARB Site Number <sup>1</sup>	Site Name	Agency	Meteorological and Air Quality Parameters <sup>2, 3</sup>
Riverside	TBD (060652007)	Indio-Amistad High School AQS	IID	O <sub>3</sub> , NO <sub>2</sub> , H <sub>2</sub> S, PM10 BAM, PM 2.5 BAM, Outdoor Temperature, Relative Humidity, Wind Direction-Scalar, Wind Direction-Resultant, Wind Speed-Resultant, Wind Speed-Scalar, Barometric Pressure
Riverside	33137	Palm Springs-Fire Station	South Coast AQMD	CO, NO <sub>2</sub> , O <sub>3</sub> , PM10, Continuous PM10, 24-hour PM2.5, Relative Humidity, Wind Direction-Scalar, Wind Direction-Resultant, Wind Speed-Resultant, Wind Speed-Scalar, Barometric Pressure
Riverside	n/a	Twenty-Nine Palms and Cabazon	Twenty-Nine Palms and Cabazon Bands of Mission Indians <sup>4</sup>	PM10, PM2.5, Wind Direction, Wind Speed, Outdoor Temperature

County	CARB Site Number <sup>1</sup>	Site Name	Agency	Meteorological and Air Quality Parameters <sup>2, 3</sup>
Riverside	33033	Mecca–Saul Martinez	South Coast AQMD	H <sub>2</sub> S, TEOM PM10, Outdoor Temperature, Relative Humidity
Riverside	33601	Torres–Martinez (aka Near-Shore)	Torres Martinez Cahuilla Indians, IID	H <sub>2</sub> S, TEOM PM2.5, Outdoor Temperature, Relative Humidity, Wind Direction-Scalar, Wind Speed-Scalar, Barometric Pressure
Imperial	13601	Bombay Beach	IID	Low-Vol PM10, TEOM PM2.5, Outdoor Temperature, Relative Humidity, Wind Direction-Scalar, Wind Speed-Scalar, Barometric Pressure
Riverside	33602	Salton Sea Park	IID	TEOM PM10, TEOM PM2.5, Outdoor Temperature, Relative Humidity, Wind Direction-Scalar, Wind Speed-Scalar, Barometric Pressure
Imperial	13603	Naval Test Base	IID	TEOM PM2.5, Outdoor Temperature, Wind Direction-Scalar, Wind Speed-Scalar
Imperial	13604	Salton City	IID	TEOM PM2.5, Outdoor Temperature, Relative Humidity, Wind Direction-Scalar, Wind Speed-Scalar, Barometric Pressure
Imperial	13602	Sonny Bono	IID	Low-Vol PM10, TEOM PM2.5, Outdoor Temperature, Wind Direction-Scalar, Wind Speed-Scalar, Barometric Pressure
Imperial	13997	Niland–English Road	ICAPCD	O <sub>3</sub> , BAM PM10, Outdoor Temperature, Wind Direction-Resultant, Wind Speed-Resultant, Barometric Pressure
Imperial	13697	Westmorland	ICAPCD	O <sub>3</sub> , BAM PM10, Outdoor Temperature, Wind Direction-Resultant, Wind Speed-Resultant, Barometric Pressure
Imperial	13701	Brawley–Main Street #2	ICAPCD	BAM PM10, BAM PM2.5

SOURCE: CARB 2024

NOTES:

1. CARB provides information on sites and parameters here: <https://ww2.arb.ca.gov/applications/quality-assurance-air-monitoring-site-list-generator-1>. This page does not necessarily reflect all parameters monitored at a site.
2. Particulate matter - sampling techniques for continuous measurement of suspended particulate matter vary among sites, including low-volume and high-volume samplers, TEOM (tapered element oscillating microbalance), and BAM (Beta Attenuation Monitor).
3. Hydrogen sulfide - Real-time H<sub>2</sub>S data is available at: <https://saltonseaodor.org/>
4. Data for the Twenty-Nine Palms and Cabazon monitoring site is available at: <https://www.29palmstribes.org/departments/tribal-epa/air-quality/>

**TABLE 2-3**  
**SALTON SEA AIR BASIN AIR QUALITY MONITORING METRICS AND METHODS**

<b>Metrics</b>	<b>Methods</b>	<b>Timing</b>
Black Carbon (CD)	Real Time, AE33 and MA350	Ongoing
Total Carbon (TC)	Real Time, Total Carbon Analyzer	Ongoing (expect end by mid 2024)
Metals	Real Time, Xact 625i	Ongoing
NO <sub>x</sub> /NO/NO <sub>2</sub>	Real Time, T200	Ongoing
O <sub>3</sub>	Real Time, T400	Ongoing
Ammonia	Real Time, Picarro	Ongoing

**Location:** As cataloged by CARB, there are 13 active air quality monitoring sites near the Salton Sea (Table 2-2). Three sites are in the north (Indio, Mecca, and Torres Martinez), two are on the east shore (Salton Sea Park, Bombay Beach), two are on the west shore (Salton City, Naval Test Base), four are in the south (Sonny Bono, Niland-English Road, Westmorland, and Brawley), and one is Palm Springs (Palm Springs Fire Station). The Cabazon and Twenty-Nine Palms tribes installed an air quality monitoring station near the Eagle Falls Golf Course in Indio.

**Timing:** Real-time continuous monitoring.

**Notes:** CARB provides information on sites and parameters online:  
<https://ww2.arb.ca.gov/applications/quality-assurance-air-monitoring-site-list-generator-1>.

## 2.1.6 Shoreline Waterbird Surveys – Tri-annual

**Implementing Partners:** PBCS, Audubon California, OBO, CDFW, USFWS.

**Description:** Coordinated regional- and flyway-scale surveys for migratory shorebirds that rely on a standardized survey protocol. The Intermountain West Shorebird Survey is a biannual survey during migration (April and August) from 2022-2026 at more than 200 freshwater wetland and saline lake sites in 11 US western states. The Pacific Flyway Shorebird Survey occurs each winter at more than 400 sites in all 13 countries of the Pacific Coast of the Americas including every December since 2010 at Salton Sea. Shorebird abundance is measured around the Salton Sea shoreline, peripheral emergent habitats around drains and wetlands including near Bombay Beach, and managed wetland complexes at Imperial Valley Wildlife Area and Sonny Bono Salton Sea National Wildlife Refuge. Incidental observations are collected for any dead and sick birds.

The Intermountain West Shorebird Survey also provides information about the abundance and distribution of Snowy Plovers along the shoreline. Although the surveys do not involve nest searching, plovers are territorial breeders, so their distribution in late April is a coarse-scale indicator of the distribution of preferred breeding habitat. The August survey will provide information on local abundance in the context of the regional population when compared to other interior sites.

Survey data will also be contributed by Oasis Bird Observatory and Audubon California from their regular monitoring locations. Volunteers and staff from Point Blue, Audubon California, CDFW, and USFWS will conduct the surveys.

Location: The survey covers the entire Salton Sea shoreline (19 segments with 85 subsegments). Surveys will also include the greater wetland complex of impoundments in Wister, Sonny Bono and SCH ponds, Bombay Beach, Ramer Lake.

Timing: Three times annually in April, August, and December.

Notes: Complete shoreline surveys are dependent upon having an airboat to cover portions of the shoreline inaccessible by foot or all-terrain vehicle (ATV). Boat access to the Sea has become difficult in recent years due to the receding shoreline. If CDFW or USFWS cannot provide a boat, additional support will be needed to purchase a boat for non-governmental organizations to lead the boat survey portion.

### 2.1.7 Shoreline Waterbird Surveys - Monthly

Implementing Partner: Audubon California.

Description: This Waterbird Survey was initiated in 2016 and was originally conducted every two months, and in 2019, timing was increased to monthly. The current survey is loosely modeled after previous Sea-wide surveys conducted by Point Reyes Bird Observatory (now known as Point Blue Conservation Science).

Location: 14 sites along the shorelines of the Salton Sea.

Timing: Monthly.

Notes: April and August surveys are part of the Intermountain West Shorebird Survey efforts, and the December survey is part of the Pacific Flyway Shorebird Survey.

### 2.1.8 Shoreline Waterbird Surveys - Weekly

Implementing Partner: OBO.

Description: Surveys for waterbirds will estimate species and numbers of birds at each site, including shoreline habitats and an open water viewshed of approximately 1 km perpendicular from the shore. Surveys are conducted during mornings and afternoons. Sites are surveyed for 60 to 120 minutes depending on the relative abundance of waterbirds to ensure accurate identifications and abundance estimates. During each survey, observer(s) record all waterbirds within approximately 1 km of the count location. Observer(s) survey shoreline, open water, and airspace with a spotting scope (20x60) and binoculars (8x42, 10x42) and record the number of species and individuals. Weekly surveys cover approximately 25 km<sup>2</sup> of the shoreline and offshore zones.

Location: Ten sites along the northern shoreline between Desert Shores and Salt Creek.

Timing: Eight sites are visited weekly, and two sites are visited monthly.

Notes: This survey has been conducted consistently since 2015.

## 2.1.9 Marshbird Callback Surveys – Restoration Sites

Implementing Partners: CDFW, Audubon California.

Description: These protocol-level marshbird surveys are intended to document baseline status of Yuma Ridgway’s rail and black rail at restoration sites, namely the proposed North Lake Pilot Project and Audubon California’s Bombay Beach wetland project.

Location: Surveys will be conducted at the Salton Sea North Lake and Torrez–Martinez area to the northwest as well as at Audubon California’s wetland project at Bombay Beach.

Timing: March 1-May 15, 2024.

## 2.1.10 Marshbird Callback Surveys – SBSSNWR

Implementing Partner: USFWS Sonny Bono Salton Sea National Wildlife Refuge (SBSSNWR).

Description: Conduct annual secretive marshbird audio call-back surveys for Ridgway’s rail, Virginia rail, black rail, least bittern, American bittern, and pied-billed grebe.

Location: South end of Salton Sea at managed marshes on the refuge and adjacent unmanaged marshes.

Timing: Annually March-May.

## 2.1.11 Wintering Waterfowl Aerial Surveys

Implementing Partner: USFWS, CDFW.

Description: Aerial survey of waterfowl wintering at the Salton Sea. In addition, an annual white goose survey is conducted in the Imperial Valley.

Location: Imperial Valley and Salton Sea.

Timing: Annually in mid-winter.

## 2.1.12 Nesting Seabirds Surveys

Implementing Partner: USFWS.

Description: Surveys for nesting seabirds of the family Laridae (gulls, terns and skimmers).

Location: Southern shoreline of Salton Sea.

Timing: Biweekly surveys in April-August.

### 2.1.13 Evening Sandhill Crane Roost Surveys

Implementing Partner: USFWS.

Description: Evening surveys for sandhill crane roosts.

Location: Throughout Imperial Valley.

Timing: Monthly surveys in September-February.

### 2.1.14 Salton Sea Fish Survey

Implementing Partner: CDFW.

Description: General fish surveys conducted by boat with nets to document fish species and abundance.

Location: Salton Sea open water.

Timing: Fall 2024.

Notes: Conducting fish surveys has become difficult in recent years due to the lack of boat access as the Salton Sea recedes. Access issues may improve in 2024 but will remain challenging due to the changing shoreline.

### 2.1.15 Desert Pupfish Survey

Implementing Partner: CDFW.

Description: Pupfish surveys are primarily conducted using minnow traps. Dip nets may be used to confirm presence if the water is too shallow to set minnow traps. Information collected during surveys includes general habitat conditions; presence and relative abundance (Catch per Unit Effort (CPUE)) of pupfish and non-native species; and basic water quality data (including conductivity, dissolved oxygen, salinity, and temperature).

Location: North Lake Pilot Project area, northern agricultural drains, southern agricultural drains, Salt Creek, and Varner Harbor. Other locations could be added based on best professional judgement, and may include areas such as outflows, seasonal shoreline pools, furrows, and interception ditches.

Timing: Each site is visited once annually during March/April to October. Some drains may be sampled more frequently if pupfish are not detected during the first survey, to confirm negative results. A few sites may be surveyed more frequently (e.g. quarterly) depending on the need for more information. Ideally, sites should be surveyed during the spring, summer, and early fall, but this is often difficult due to staff workload.

## 2.1.16 Salton Sea Management Program and Community Engagement Committee

Implementing Partner: SSMP.

Description: The SSMP Community Engagement Committee and its subcommittees serve as the hub and primary venue to plan engagement activities and identify best outreach and involvement strategies for SSMP public events. The Community Engagement Committee consists of representatives from community-based organizations, stakeholder groups, local leaders, governmental agencies, and Tribal governments. It enlists leaders of local community groups and nongovernmental organizations (NGOs) to help guide SSMP engagement efforts, reach community members through varying communications channels, and increase community engagement in SSMP planning activities. The Committee is led by two co-chairs, one from Alianza Coachella Valley and one from County of Imperial.

Location: Virtual meetings.

Timing: Various meetings throughout the year.

Notes: Meetings occur in preparation for public community meetings and engagement opportunities.

## 2.1.17 Salton Sea Management Program Engagement Opportunities and Outreach

Implementing Partner: SSMP.

Description: The SSMP Team hosts regular public meetings and workshops to share information and gather community feedback. The SSMP Team continues to use and is working to update to a comprehensive website, [www.saltonsea.ca.gov](http://www.saltonsea.ca.gov), to continue to provide information on SSMP projects, processes, and provide opportunities to receive input. Additionally, the SSMP Team are anticipating the public release of the SSMP Project Tracker for public view in 2024.

The State also continues to share news, engagement opportunities, and project updates via the SSMP Update e-newsletter. The SSMP Update e-newsletter is distributed through the California Natural Resources Agency Salton Sea Mailing list to over 1,600 subscribers.

Location: Virtual meetings and in-person meetings in communities around the Salton Sea.

Timing: Various meetings throughout the year.

Notes: Newsletters are issued monthly or when needed for updates.

## 2.1.18 Salton Sea Management Program and Community Needs

Implementing Partner: CNRA.

Description: Acknowledging the concerns raised by community members and advocates over the past decades about the actions and inactions in the Salton Sea region, CNRA recognized the need to better understand community needs and identify better pathways to achieve co-benefits while achieving the SSMP's goals and commitments to implement nearly 30,000 acres of dust suppression and habitat restoration projects. The Salton Sea Management Program and Community Needs Report identifies community needs related to the Salton Sea, describes the status of SSMP efforts, and lists potential opportunities for the SSMP to address community needs while implementing restoration projects.

Accompanying the release of the SSMP report is a public draft of the Salton Sea Community Needs and Recommended Actions Report by Better World Group Advisors. This document reflects the broader feedback of community members and tribes in public comment letters, interviews, and work group sessions as a part of CNRA and Better World Group's public engagement project. This report identifies community needs and recommends actions that can be taken by federal, state, and local government agencies, business organizations, philanthropy, community-based groups, and nonprofit organizations.

Location: Communities around the Salton Sea.

Timing: Surveys and meetings conducted in 2023.

Notes: The draft reports were released in January 2024.

## 2.2 Focused Studies

### 2.2.1 Surface Water and Groundwater Budgets

Implementing Partners: USBR, USGS.

Description: In the Salton Sea watershed, the magnitude and extent of groundwater use and its effect on surface water features, such as springs and marshes, is poorly understood. In recent years, the Salton Sea's water level has lowered, resulting in receding shorelines and increased lake salinity. With changes in groundwater pumping and lake-groundwater interactions, the groundwater levels have also fluctuated. Currently, there is no tool for making informed water management decisions for the Salton Sea basin that includes adequate groundwater-surface water interactions.

Location: Salton Sea HUC6 watershed, with greater detail considered in the northern region near the Torres Martinez Reservation.

Timing: Not specified.

Notes: Intermediate products expected in FY 2026 with study completion date to be determined.



## 2.2.2 Spatial and Temporal Patterns and Controls on Water-Column Redox and Temperature Structures in the Salton Sea

Implementing Partner: UCR (Caroline Hung, Charlie Diamond, and Timothy Lyons).

Description: Study of oxygen and sulfur geochemistry in the water column and relationships to decreasing water depth in the Salton Sea.

Location: Entire Salton Sea basin, including shallow and deep water.

Timing: Not specified.

## 2.2.3 Sulfur Cycling in the Salton Sea Water Column and Sediments

Implementing Partner: UCR (Caroline Hung, Charlie Diamond, and Timothy Lyons).

Description: Study of dissolved and solid-phase sulfur species (reduced and oxidized, concentrations and isotopic relationships).

Location: Entire Salton Sea basin, including shallow and deep water.

Timing: Not specified.

## 2.2.4 Nutrient Sources, Sinks, and Cycles in the Salton Sea

Implementing Partner: UCR (Caroline Hung, Charlie Diamond, and Timothy Lyons) with Loma Linda University.

Description: Study of nutrient patterns, cycles, and controls (P and N).

Location: Entire Salton Sea basin, including shallow and deep water.

Timing: Not specified.

## 2.2.5 Selenium Cycling and Bioaccumulation in Foodwebs in Salton Sea Wetlands

Implementing Partners: USGS Western Ecological Research Center and USGS California Water Science Center.

Description: The Salton Sea water elevation has declined, resulting in the creation of new wetlands caused by drains and rivers no longer reaching the Salton Sea. This study is assessing the levels and possible effects of selenium and related metals to help evaluate whether such wetlands are suitable for migratory and endangered birds. The initial phase of this work

consisted of a data compilation and review assessment of selenium in the Salton Sea region (Rosen et al. 2023).

A phased study plan was designed to assess potential selenium risks to a federally endangered bird species, the Yuma Ridgway's rail (*Rallus obsoletus yumanensis*), in wetlands around the southern part of the Salton Sea. The first phase of this work (Phase I) consisted of pilot work that is now complete (de la Cruz et al. 2022; Grover et al. 2022). This pilot work was designed to inform more detailed sample collection in the second phase (Phase II). Phase II is now ongoing. The data from the first two phases will then be used in phase three (Phase III) – a selenium risk assessment model for the Yuma Ridgway's rail.

Phase I sampling was done in 2021 and 2022, Phase II started in January 2023 and is ongoing into spring 2024, and Phase III is anticipated to start in late 2024.

This study examined sites with different water sources and management strategies (i.e., managed vs. unmanaged wetland) to gather information needed for foodweb and selenium models. Water and sediment data collection focuses on selenium, nutrients, and associated trace elements. These data will provide information on how selenium may move from dissolved forms in the inflowing drain water into forms that may find their way into wetland food webs. Water and sediment sample collection is tightly paired with biological sample collection at the base of wetland food webs (detritus, particulate organic matter, algae, periphyton, vascular plants, benthic invertebrates, aquatic invertebrates, and fish/crayfish). The USGS cooperative research unit at the University of Idaho is providing Yuma Ridgway's rail tissues (blood for selenium and fecal matter for DNA) for analyses.

Location: The study sites include managed wetlands (Hazard 9a and Unit 3a) and unmanaged emerging wetlands (Lack & Lindsey, McKendry, and Poe Road) around the southern Salton Sea.

Timing: Sampling will occur in March and April 2024.

Notes: Information available from USGS here:

<https://www.usgs.gov/index.php/centers/california-water-science-center/science/selenium-cycling-salton-sea-wetlands#overview>

## 2.2.6 Selenium Concentrations in Yuma Ridgway's Rails and Prey

Implementing Partners: USGS, USFWS, University of Idaho.

Description: We are collecting blood and feather samples from Yuma Ridgway's rails at marshes around the Salton Sea. We are also collecting rail prey items in those same marshes. We will test blood, feathers, and prey samples for selenium concentrations. Selenium concentrations can vary between marshes fed by Colorado River water versus agricultural runoff. We aim to document and compare selenium concentrations in Yuma Ridgway's rails throughout their range.

Location: Marshes around the Salton Sea.

Timing: Capture and sample collection from Yuma Ridgway's rails will occur between March and May 2024.

## 2.2.7 Trace Metal Patterns and Controls in the Sediments of the Salton Sea

Implementing Partner: UCR (Caroline Hung, Charlie Diamond, and Timothy Lyons).

Description: Study of bulk trace metal enrichments in Salton Sea sediments.

Location: Entire Salton Sea basin, including shallow and deep water.

Timing: Not specified.

## 2.2.8 Patterns of Pesticide Enrichment in Salton Sea Sediments

Implementing Partners: UCR (Timothy Lyons research group), SDSU.

Description: Study of pesticides and breakdown products in sediments.

Location: Entire Salton Sea basin, including shallow and deep water.

Timing: Not specified.

## 2.2.9 Lithium Measurements in Sediments and Surface Water

Implementing Partner: UCR (Michael McKibbin and Charlie Diamond).

Description: Spot measurements of lithium isotopes and lithium concentration in seafloor sediments, sea open water, and river inputs (Alamo River, New River, and Whitewater River).

Location: Salton Sea near river inputs.

Timing: One sampling event planned for early 2024 (January-March).

## 2.2.10 Salton Sea Coastal Zone Soil Survey

Implementing Partners: USDA Natural Resources Conservation Service, Bureau of Land Management, IID.

Description: The Bureau of Land Management, IID, and the Soil and Plant Science Division of the USDA NRCS are completing a soil survey on the exposed playas along the margin of the Salton Sea shoreline (USDA NRCS 2023). As the Salton Sea's water level dropped, a vast amount of sea floor has been exposed. The exposed former sea floor of this shallow, saline lake (with salt levels double that of the Pacific Ocean) created a soil data gap between the published soil survey data

and new shoreline of the Salton Sea. To fill in the missing soil survey information, soil cores collected by Formation Environmental for IID provided a comprehensive collection of soil data and laboratory analysis to support expanding the soil survey mapping.

Location: Exposed playas along the margin of the Salton Sea shoreline.

Timing: This soil survey project is scheduled to be completed in 2024.

### 2.2.11 Microbially and Enzyme-Induced Calcite Precipitation for Mitigation of Fugitive Dust

Implementing Partner: USBR, Arizona State University, IID.

Description: Biocementation methods, including microbially and enzyme-induced calcium carbonate (calcite) precipitation, offer a potential mitigation method for fugitive dust (Esahi 2023). Field trials are planned to include microbially and enzyme-induced calcite precipitation and a biopolymer.

Location: IID land near Salton City.

Timing: Plot implementation in fall 2024.

### 2.2.12 Aerosolized Toxins around the Salton Sea

Implementing Partner: UCR (Emma Aronson, Roya Bahreini, and David Lo).

Description: Analysis of aerosolized toxins using passive dust collectors and soil sampling for biological assays and mouse chamber exposure experiments.

Location: Coachella and Imperial Valleys.

Timing: Not specified.

### 2.2.13 Public Health Impacts from Salton Sea Playa Dust

Implementing Partners: UCR (David Lo, Emma Aronson, Roya Bahreini (BREATHE Center), David Cocker (CE-CERT)).

Description: The high incidence of childhood asthma in the Salton Sea region is associated with proximity and exposure to aerosol dusts generated at the exposed playa. These studies are aimed at identifying the biological and clinical effects of the playa dusts, including identification of the most toxic or inflammatory dust components, the related pathological mechanisms, and their clinical symptom correlates. In addition, the studies aim to understand the source of the toxic material in the dust and how it is entrained in the playa dust, and how playa features may favor the production of the toxic dust.

Location: Coachella and Imperial Valleys.

Timing: Studies are ongoing, and are expected to continue through Spring 2026 or later.

Notes: Funding provided by National Institute on Minority Health and Health Disparities/NIH (U54 MD013368), California Air Resources Board (ARB 21RD014 LO 8/22), Bureau of Reclamation (R23AP00088) to DL.

## 2.2.14 Low-Cost Ambient Air Quality Network Development

Implementing Partner: UCR (William Porter).

Description: Ongoing deployment of Quant-AQ MODULAIR-PM units to gather publicly available size-resolved particulate matter measurements and to supplement existing regulatory agency sites and low-cost sensor networks (such as IVAN [Identifying Violations Affecting Neighborhoods], a community-based environmental monitoring system).

Location: Coachella and Imperial Valleys.

Timing: Not specified.

## 2.2.15 Indoor Air Quality and Filtration Study

Implementing Partner: UCR (William Porter, Ashley Trinidad, Ann Cheney, and Sonia Rodriguez).

Description: One year of indoor particulate matter measurements using low-costs sensors, as well as deployment of “do it yourself” (DIY) air filtration units to assess effectiveness at reducing indoor particulates.

Location: Coachella and Imperial Valleys.

Timing: Began in summer 2023, and the project is continuing through summer 2024.

## 2.2.16 Salton Sea Air Quality Assessment

Implementing Partner: The Pacific Institute

Description: The objectives of the Institute's new Salton Sea air quality assessment are to identify and analyze relevant research on dust emissions, air quality, and related public health outcomes in the Salton Sea region and identify significant data and research gaps, resulting in a synthesis report; identify best management practices and innovative solutions to address these air quality challenges; and communicate the current state of the science and knowledge gaps in these areas to policymakers, SSMP, and stakeholders.

Location: Data will be compiled from recent studies and reports from areas immediately adjacent to the Sea and surrounding areas.

Timing: No new data collection is scheduled.

Notes: Report to be released by end of 2024.

## 2.2.17 Yuma Ridgway's Rail Movements and Migration Behavior

Implementing Partners: University of Idaho, USGS.

Description: Researchers capture and attach satellite GPS transmitters to Yuma Ridgway's rails in marshes around the Salton Sea and along the Lower Colorado River (Arizona). The data from the transmitters will reveal spatial and temporal patterns in the dispersal and long-distance migration behaviors of the Yuma Ridgway's rails. These data will inform management of existing habitat and assist in identifying areas for new marsh creation/restoration projects.

Location: Marshes around the Salton Sea and in Arizona along the Lower Colorado River.

Timing: Researchers will deploy satellite GPS transmitters between March and May 2024. The transmitters will report location data throughout 2024.

## 2.2.18 Microbial Ecology: Patterns of Lateral and Vertical Variability and Controls

Implementing Partner: UCR (Lyons research group with Emma Aronson and group).

Description: Microbial population study in Salton Sea water column.

Location: Entire basin, shallow and deep water.

Timing: Not specified.

## 2.3 Effectiveness Monitoring

### 2.3.1 Salton Sea Management Program Species Conservation Habitat Project

Implementing Partners: DWR, CDFW, and Colorado River Basin RWQCB.

Description: The Species Conservation Habitat Project (SCH Project) is constructing saline habitat ponds at the mouth of the New River. In 2024, some portions of the ponds will be commissioned (i.e., will receive water and be partially wetted). Monitoring will measure inflows using Supervisory Control and Data Acquisition (SCADA), a computer-based system for gathering and analyzing real-time data to monitor and control equipment that deals with time-sensitive operations. Measurements will be taken at the saline pump station, water intake structure, and sedimentation basins. Continuous monitoring will use EXO3 Sonde units to measure salinity (measured as TDS), water temperature, dissolved oxygen, and water depth.

In addition, water samples will be collected from the west interception ditch along the SCH ponds. The samples will be tested for TDS, TSS, nutrients, contaminants (pesticides, herbicides, and metals such as arsenic and boron), selenium, and pathogens (bacteria, enterococcus).

Location: SCH Project (west interception ditch and wetted areas of Center and East Ponds), which flanks the mouth of the New River in the southern Salton Sea.

Timing: The west interception ditch will be monitored quarterly. Pond water supply operations will be measured continuously with sondes when the ponds are commissioned and partially wetted (date to be determined).

### 2.3.2 Salton Sea Management Program Dust Suppression Project Monitoring

Implementing Partner: DWR.

Description: DWR has implemented three vegetation enhancement projects on Reclamation lands (Clubhouse, 399 acres; Tule Wash, 1,217 acres; and West Bombay Beach, 91 acres). Vegetation was seeded/planted and irrigated within rows of grass bales. Dust suppression through temporary engineered roughness is being placed on other areas.

Meteorological and air quality monitoring is underway to assess the performance of hay bales in reducing wind speed and dust emissions from the playa. Fixed stations with monitoring equipment measure particulate matters (PM<sub>10</sub>, PM<sub>2.5</sub>), wind speed, wind direction, air temperature, precipitation, relative humidity, precipitation saltation, relative humidity temperature, barometric pressure, and saltation flux.

Location: Monitoring is conducted at the Clubhouse, Tule Wash, and West Bombay Beach sites. At each revegetation site, fixed stations are placed in a transect at three locations (upwind, within, and downwind of the bale arrays) along the south-southwest (249 degrees) axis, which is the predominant direction of wind events that lead to emission of PM<sub>10</sub>.

Timing: High frequency measurements, every 1-minute data collection for PM<sub>10</sub> and PM<sub>2.5</sub>, and every 10-minutes for the remaining parameters. Monitoring is conducted year-round.

### 2.3.3 Salton Sea Air Quality Mitigation Program

Implementing Partner: IID.

Description: The IID Salton Sea Air Quality Mitigation Program was developed in 2016 in cooperation with ICAPCD. This program monitors dust emissions (PM<sub>10</sub>) and effectiveness of dust suppression activities.

Location: Dust suppression project areas along the shoreline and playa.

Timing: Real-time continuous.

Notes: Information sourced from IID website: <https://saltonseaprogram.com/aqm/>

This page intentionally left blank



# CHAPTER 3

---

## Discussion

### 3.1 Data Needs and Opportunities

Many of the priority indicators identified in the MIP are being monitored and/or are the subject of a focused study, as summarized in **Table 3-1**. There remain, however, several primary indicators that were recommended in the MIP but are not reflected in the 2024 Work Plan, either because a study has not been planned, is unknown, or was not reported. These uncertainties or gaps may also reflect limitations of outreach to potential implementing partners and voluntary reporting. Primary priority indicators not known to be monitored or studied in 2024 include the following:

- Aerial surveys to capture land cover, habitat types, and playa extent. This may present an opportunity to explore use of remote sensing technology such as drones.
- Groundwater well surveys to measure elevation, conductivity, temperature, dissolved oxygen, pH, depth, nutrients, TDS, TSS, and contaminants.
- Harmful algal blooms in surface water.
- Aerial surveys for piscivorous birds and colonial breeding birds are not planned for 2024; however, aerial surveys for waterfowl are being conducted by USFWS.
- Southwestern willow flycatcher survey.

Opportunities exist to standardize sampling and data collection methodologies and reporting across implementing partners.

### 3.2 Future Annual Work Plans and Reporting

This first MIP Annual Work Plan demonstrates the breadth of monitoring and research at the Salton Sea and can be a foundation for further collaboration and coordination. Future Work Plans may include additional information, as available, including standard operating procedures and more detail regarding logistics and coordinated survey efforts. Implementing partners are encouraged to participate in an annual coordination meeting in October to develop future Work Plans.

Annual reporting is dependent on available funding. If funding is available, the annual report will summarize the data collected by the SSMP agencies (CDFW and DWR) and by implementing partners, where known. Annual reports would also include a summary of data collected during each year and cumulatively as well as recommendations for adjustment and improvement of survey locations and sampling protocol. To facilitate this process, implementing partners are encouraged to submit a summary of activities that were conducted in 2024, challenges and lessons learned from 2024 efforts, annual reports (if available), data needs and opportunities for 2025, and confirmation of anticipated monitoring activities in 2025.

**TABLE 3-1  
2024 MONITORING AND STUDIES COMPARED WITH MIP PRIORITIES**

Resource	Indicators	Priority	Status Monitoring <sup>1, 2</sup>	Focused Studies <sup>1, 2</sup>	Effectiveness Monitoring <sup>1, 2</sup>
Hydrology	Surface water (inflow, surface elevation)	1	<ul style="list-style-type: none"> <li>• Surface water monitoring (USGS) (2.1.1)</li> <li>• CVWD agricultural drain monitoring (CVWD) (2.1.3)</li> </ul>		<ul style="list-style-type: none"> <li>• SSMP Species Conservation Habitat Project (DWR) (2.3.1)</li> </ul>
	Groundwater	1		<ul style="list-style-type: none"> <li>• Surface and groundwater budgets (USBR, USGS) (2.2.1)</li> </ul>	
Water Quality	Basic water quality (temperature, TDS)	1	<ul style="list-style-type: none"> <li>• Salton Sea water quality monitoring (CDFW, Colorado River Basin RWQCB) (2.1.2)</li> <li>• CVWD agricultural drain monitoring (CVWD) (2.1.3)</li> <li>• Salton Sea Environmental Timeseries (Alianza, LLU) (2.1.4)</li> </ul>	<ul style="list-style-type: none"> <li>• Water column redox and temperature (UCR) (2.2.2)</li> <li>• Water column sulfur cycling (UCR) (2.2.3)</li> </ul>	<ul style="list-style-type: none"> <li>• SSMP Species Conservation Habitat Project (DWR, CDFW, Colorado River Basin RWQCB) (2.3.1)</li> </ul>
	Nutrients	1	<ul style="list-style-type: none"> <li>• Salton Sea Environmental Timeseries (Alianza, LLU) (2.1.4)</li> </ul>	<ul style="list-style-type: none"> <li>• Nutrients in Salton Sea (UCR) (2.2.4)</li> </ul>	<ul style="list-style-type: none"> <li>• SSMP Species Conservation Habitat Project (DWR, CDFW, Colorado River Basin RWQCB) (2.3.1)</li> </ul>
	Selenium (water, sediments)	1			<ul style="list-style-type: none"> <li>• SSMP Species Conservation Habitat Project (DWR, CDFW, Colorado River Basin RWQCB) (2.3.1)</li> </ul>
	Selenium (biota)	1-3		<ul style="list-style-type: none"> <li>• Selenium in wetland foodwebs (USGS) (2.2.5)</li> <li>• Selenium in Yuma Ridgway’s rails and prey (U. Idaho, USGS, USFWS) (2.2.6)</li> </ul>	

Resource	Indicators	Priority	Status Monitoring <sup>1, 2</sup>	Focused Studies <sup>1, 2</sup>	Effectiveness Monitoring <sup>1, 2</sup>
	Pesticides, metals	2		<ul style="list-style-type: none"> <li>Trace metals in sediments (UCR) (2.2.7)</li> <li>Pesticides in sediments (UCR, SDSU) (2.2.8)</li> <li>Lithium in water and sediments (UCR) (2.2.9)</li> </ul>	<ul style="list-style-type: none"> <li>SSMP Species Conservation Habitat Project (DWR, CDFW, Colorado River Basin RWQCB) (2.3.1)</li> </ul>
	Harmful algal blooms	1			
	Pathogens				<ul style="list-style-type: none"> <li>SSMP Species Conservation Habitat Project (DWR, CDFW, Colorado River Basin RWQCB) (2.3.1)</li> </ul>
Geography	Land cover, playa area	1		<ul style="list-style-type: none"> <li>Salton Sea coastal zone soil survey (USGS, IID, USBR) (2.2.10)</li> </ul>	
Air Quality	Meteorology	1	<ul style="list-style-type: none"> <li>Meteorology and air quality monitoring (South Coast AQMD, ICAPCD, IID, TM, 29 Palms/Cabazon) (2.1.5)</li> </ul>		
	Particulate matter (PM10 and PM2.5)	1	<ul style="list-style-type: none"> <li>Salton Sea Environmental Timeseries (Alianza) (2.1.4)</li> <li>Meteorology and air quality monitoring (South Coast AQMD, ICAPCD, IID, TM, 29 Palms/Cabazon) (2.1.5)</li> </ul>	<ul style="list-style-type: none"> <li>Microbially and enzyme-induced calcite precipitation (soil crust) (ASU, IID, USBR) (2.2.11)</li> </ul>	<ul style="list-style-type: none"> <li>SSMP dust suppression projects (DWR) (2.3.2)</li> <li>Salton Sea Air Quality Mitigation Program (IID) (2.3.3.)</li> <li>Testing calcite precipitation for fugitive dust (USDA-NRCS) (2.2.11)</li> </ul>
	Hydrogen sulfide	1	<ul style="list-style-type: none"> <li>Meteorology and air quality monitoring (South Coast AQMD, TM) (2.1.5)</li> </ul>		
	Particulate matter chemistry	3		<ul style="list-style-type: none"> <li>Aerosolized toxins (UCR) (2.2.12)</li> </ul>	

Resource	Indicators	Priority	Status Monitoring <sup>1, 2</sup>	Focused Studies <sup>1, 2</sup>	Effectiveness Monitoring <sup>1, 2</sup>
	General air quality	3		<ul style="list-style-type: none"> <li>Indoor air quality and filtration (UCR) (2.2.15)</li> <li>Salton Sea air quality assessment (Pacific Institute) (2.2.16)</li> </ul>	
Biological - Birds	Shoreline waterbirds	1	<ul style="list-style-type: none"> <li>Shoreline waterbirds–tri-annual (PBCS, Audubon, OBO, CDFW, USFWS) (2.1.6)</li> <li>Shoreline waterbirds–monthly (Audubon CA) (2.1.7)</li> <li>Shoreline waterbirds–weekly north shore (OBO) (2.1.8)</li> </ul>		
	Marsh birds (Yuma Ridgway’s rail, black rail)	1	<ul style="list-style-type: none"> <li>Marshbird callback survey – restoration sites (CDFW, Audubon CA) (2.1.9)</li> <li>Marshbird callback survey - SBSSNWR (USFWS) (2.1.10)</li> </ul>		
	Yuma Ridgway’s rail	1		<ul style="list-style-type: none"> <li>Yuma Ridgway’s rail movements and migration (USGS, U. of Idaho) (2.2.17)</li> <li>Selenium in rails and prey (USGS, USFWS, U. of Idaho) (2.2.6)</li> </ul>	
	Piscivorous bird (aerial survey)	1	<ul style="list-style-type: none"> <li>Wintering waterfowl aerial survey (not piscivorous birds) (CDFW, USFWS) (2.1.11)</li> </ul>		
	Colonial birds (breeding, roosting) (aerial survey)	1-2	<ul style="list-style-type: none"> <li>Nesting seabird aerial survey (not colonial) (USFWS) (2.1.12)</li> <li>Sandhill crane winter roost survey (USFWS) (2.1.13)</li> </ul>		
	Southwestern willow flycatcher	1			
	Western snowy plover	2			

Resource	Indicators	Priority	Status Monitoring <sup>1, 2</sup>	Focused Studies <sup>1, 2</sup>	Effectiveness Monitoring <sup>1, 2</sup>
Biological - Aquatic	Fish in Salton Sea	1	<ul style="list-style-type: none"> <li>General fish survey (CDFW) (2.1.14)</li> </ul>		
	Desert pupfish	1	<ul style="list-style-type: none"> <li>Desert pupfish surveys (CDFW) (2.1.15)</li> </ul>		
	Phytoplankton, zooplankton, benthic macroinvertebrates	2			
	Harmful algal blooms	1			
	Microbial loop, pathogens	3		<ul style="list-style-type: none"> <li>Microbial ecology (UCR) (2.2.18)</li> </ul>	
Socio-economic	SSMP event public participation	1	<ul style="list-style-type: none"> <li>Community Engagement Committee (SSMP) (2.1.16, 2.1.17)</li> </ul>		
	Community benefits	1	<ul style="list-style-type: none"> <li>Community needs (SSMP) (2.1.18)</li> </ul>		
	Economic indicators	2			

## NOTES:

Numbers correspond to sections describing each monitoring element in Chapter 2.

Abbreviations: 29 Palms/Cabazon = 29 Palms Band and Cabazon Band of Mission Indians; Alianza = Alianza Coachella Valley; ASU = Arizona State University; Audubon CA = National Audubon Society; CDFW= California Department of Fish and Wildlife; CNRA = California Natural Resources Agency; CVWD = Coachella Valley Water District; DWR = Department of Water Resources; IID = Imperial Irrigation District; LLU = Loma Linda University; OBO = Oasis Bird Observatory; PBCS = Point Blue Conservation Science; RWQCB = Colorado River Basin Regional Water Quality Control Board; South Coast AQMD = South Coast Air Quality Management District; SDSU = San Diego State University; SSMP = Salton Sea Management Program; UCR = University of California Riverside; U. Idaho = University of Idaho; USBR = U.S. Bureau of Reclamation; USDA-NRCS = U.S. Department of Agriculture Natural Resources Conservation Service; USGS= U.S. Geological Survey.

This page intentionally left blank

## CHAPTER 4

---

### References

- California Natural Resources Agency. 2022. Salton Sea Monitoring Implementation Plan. February 2022.
- de La Cruz, S.E.W., Woo, I., Antonino, C.Y., Hall, L.A., Ricca, M.A., and Miles, A.K. 2022. Biological tissue data used to evaluate selenium hazards in the Salton Sea ecosystem (1994–2020): U.S. Geological Survey data release, <https://doi.org/10.5066/P9ECP700>.
- Esahi, F. 2023. Efficacy and Durability of Microbially/Enzyme-Induced Carbonate Precipitation (MICP/EICP) for Dust Mitigation of Various Soil Types and Under Different Environmental Conditions. Doctoral Dissertation. Arizona State University. 134 pp. <https://keep.lib.asu.edu/items/190939>
- Groover, K., Roberts, S.A., McPherson, J.W., and Rosen, M.R. 2022. Water and sediment data used to evaluate selenium hazards in the Salton Sea ecosystem: U.S. Geological Survey data release, <https://doi.org/10.5066/P9VIK7LK>.
- Rosen, M.R., De La Cruz, S.E.W., Groover, K.D., Woo, I., Roberts, S.A., Davis, M.J., and Antonino, C.Y. 2023. Selenium hazards in the Salton Sea environment—Summary of current knowledge to inform future wetland management: U.S. Geological Survey Scientific Investigations Report 2023–5042, 112 p., <https://doi.org/10.3133/sir20235042>.
- U.S. Department of Agriculture. Natural Resources Conservation Service. 2023. Coastal Zone Soil Survey Focus Team Fiscal Year 2023 Report. <https://www.nrcs.usda.gov/sites/default/files/2023-07/CZSS-FY23-Annual-Report.pdf>

This page intentionally left blank