UCLA Latino Policy & Politics Institute

INADEQUATE GOVERNMENT-LED WATER-QUALITY MONITORING HINDERS IMPROVEMENT EFFORTS IN THE SALTON SEA

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SEPTEMBER 2025

EXECUTIVE SUMMARY

California's largest inland body of water, the Salton Sea, has faced severe environmental degradation, leaving lasting impacts on surrounding desert communities. Situated between Riverside and Imperial counties, the lake has endured the effects of jurisdictional challenges, climate change, and unsustainable agricultural practices that have exacerbated nutrient pollution to levels surpassing those found in most lakes across the United States.

Data collected over 16 years of quarterly government sampling and 12 months of high-frequency sampling—conducted collaboratively by local communities and the University of California, Los Angeles—consistently reveal high concentrations of nitrates and dangerously low oxygen levels in the water column. These nutrient-rich conditions create an environment conducive to hydrogen sulfide emissions, which persist around the Salton Sea at levels that exceed health standards and raise ongoing concerns within the community.

The State of California and the federal government are contractually obligated to restore the Salton Sea. To address the water-quality issues and their consequences, we recommend a combination of environmental and economic remediation efforts aimed at improving the Salton Sea's ecosystem and its resulting impact on nearby communities, including:

1. Establish and Enforce Total Maximum Daily Loads
2. Establish a Community Compensation Funds
3. Fund Nutrient Bioremediation Projects
4. Increase the Frequency of Water-Quality Monitoring and the Accessibility of the Data

INTRODUCTION

Although the Salton Sea, California's largest lake, currently relies on agricultural runoff from the Colorado River to maintain its water level, historically, it was the site of Lake Cahuilla, which naturally replenished and disappeared approximately every 100 years.[1] In 2003, the Coachella and Imperial valleys signed the Quantification Settlement Agreement (QSA), reallocating water rights contributing to the Salton Sea to the San Diego County Water Authority.[2] This agreement, reinforced by prolonged droughts, reduced annual river discharge into the lake by roughly 22% between 2004 and 2024.[3] As a result, the average water level of the Salton Sea has declined by approximately 0.2 meters per year since 2004. This decline has contributed to broader environmental degradation by concentrating pollutants, altering salinity, and harming local ecosystems.

The communities surrounding the Salton Sea mainly consist of indigenous, Latinx, and immigrant populations. Approximately 25% of residents live below the poverty line.[4] These communities face ongoing environmental burdens, including hydrogen sulfide (H_2S) odors from the Salton Sea. Chronic exposure to these odors, even at relatively low concentrations, has been linked to physical ailments such as headaches, nausea, and respiratory irritation.[5] Near the Salton Sea, H_2S concentrations frequently exceed the California Air Resources Board (CARB) air-quality standards for extended periods during the summer, highlighting significant environmental justice issues.[6]

This brief discusses the water-quality of the Salton Sea, its relationship to air-quality, and the research initiatives aimed at supporting community advocacy. It argues that government agencies do not sample frequently or transparently enough, leading to biased conclusions about the lake's environmental conditions. When data is eventually made available, it is often presented in formats that require specialized knowledge for access and interpretation, which community members may not possess. This lack of accessibility, identified as an environmental injustice,[7] hinders the ability of affected communities to advocate effectively for change.

METHODS

This brief draws on publicly available data from government-led monitoring by the U.S. Bureau of Reclamation[8] and water-quality initiatives spearheaded by the Salton Sea Environmental Timeseries (SSET), the community science branch of Alianza Coachella Valley (saltonseascience.org). Established in 2021, SSET fosters collaboration between community members and researchers from University of California, Los Angeles, Loma Linda University, and Brown University to investigate the water and air-quality of the Salton Sea.

Key data sources for this analysis include (a) a 16-year time series (2004–2020) of quarterly dissolved oxygen measurements and nitrate concentrations from the USBR, (b) high-resolution data from SSET's moored instruments, and (c) satellite-based observations (Figure 1). While the full datasets are not included here, it is important to note that SSET's moored instruments have been continuously collecting data for more than a year. The observations include atmospheric hydrogen sulfide concentrations recorded at one-minute intervals, dissolved oxygen concentrations measured at one-minute intervals across 0.5-meter depth increments, water temperature recorded every four seconds at 0.5-meter depth intervals, and nitrate concentrations measured hourly near the bottom of the water column.

Figure 1. Map of Instrument and Sampling Locations

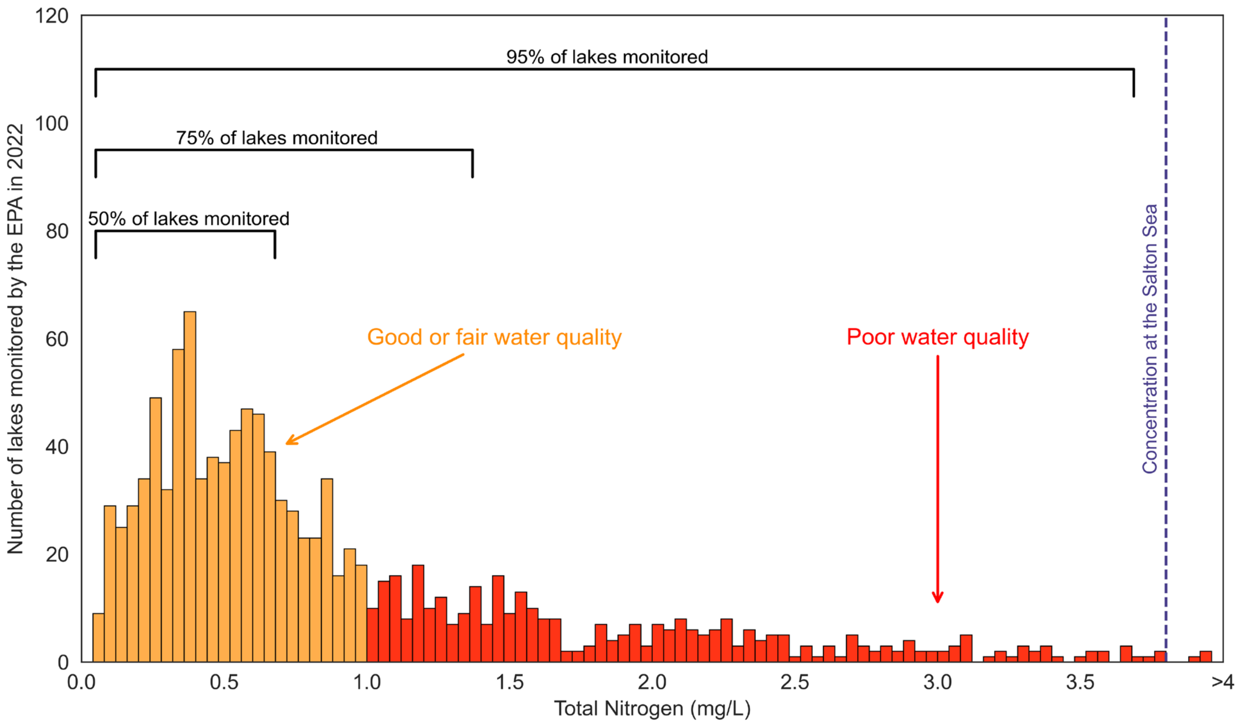
Note: Sampling locations include USBR sites (sampled from 2004 to 2020) and the SSET moored instrument station (continuously monitoring water conditions beginning in 2024). The background is a LANDSAT image from May 16, 2025, depicting a bloom visible from satellite imagery.

FINDINGS

Finding 1: Salton Sea nitrogen levels far exceed the EPA criterion for water quality in lakes.

Every five years, the Environmental Protection Agency (EPA) assesses water-quality in lakes across the U.S. To evaluate the condition of the Salton Sea, we compare nutrient levels measured by the USBR to the national data from the EPA. According to the U.S. EPA 2022 National Lakes Assessment,[9] the nitrogen levels in the Salton Sea measured by the USBR between 2015 and 2022 have median values that exceed those of 95% of lakes in the U.S. Specifically, the median nitrogen concentration in the Salton Sea is more than 3.75 times the acceptable threshold of ~1 mg/L of total nitrogen (Figure 2). Based on EPA standards, the nitrogen levels in the Salton Sea classify it as having "poor" water-quality. Excessively high nutrient levels can disrupt the lake's aquatic environment, causing imbalances in biogeochemical processes and leading to uncontrolled algal blooms.

Figure 2. Total Nitrogen Concentrations Measured by the EPA across U.S. Lakes in the 2022 National Lakes Assessment



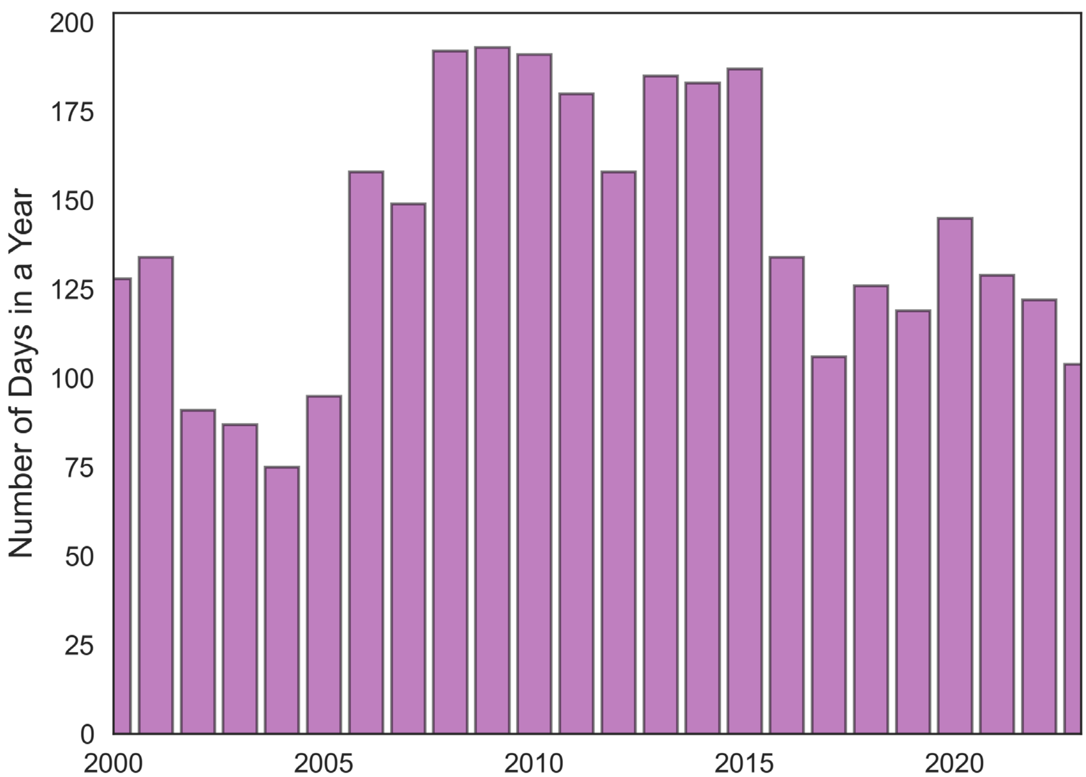
Note: The orange bars represent the number of lakes with good or fair water-quality (based on the EPA definition), while the red bars indicate those with poor water-quality based on nitrogen levels. These results are compared to the USBR measurements from 2015 to 2022, which highlight the median nitrogen concentrations in the Salton Sea, indicated by a vertical dashed line.

Finding 2: Salton Sea Microalgae Presence Far Exceeds the EPA Criterion for Water Quality in Lakes

Excessive nutrients in water bodies promote algal growth,[10] and this is reflected in the widespread microalgae coverage in the Salton Sea. Chlorophyll is an indicator of algal presence, and an excess of this compound is associated with nutrient enrichment.[11] For desert-like (or xeric) areas, such as the desert that is home to the Salton Sea, any chlorophyll concentrations exceeding 9 µg/L indicate poor water-quality in the EPA National Lake Assessment.[12]

Following this criterion, we evaluated the Salton Sea's water-quality using chlorophyll concentrations derived from NASA MODIS, a Moderate Resolution Imaging Spectroradiometer tool on NASA satellites. We find that at least 25% of the Salton Sea area has chlorophyll concentrations that exceed the EPA's acceptable threshold of 9 µg/L for 50 days each year, with some years experiencing more than 190 such days (Figure 3). Such algal blooms can deplete oxygen levels, historically leading to fish kills and economic impact.[13] A recent study suggests that algae blooms may play a role in increased hospital visits.[14] Thus, there is an urgent need for government intervention to address the nutrient pollution driving this algal growth.

Figure 3. Number of Days Exceeding the EPA Acceptable Threshold for Chlorophyll Concentrations in the Salton Sea



Note: The figures shows the number of day in which at least 25% of the Salton Sea's surface area had chlorophyll concentrations exceeding 9 µg/L. The EPA's acceptable threshold is 9 µg/L for 50 days each year. Chlorophyll is an indicator of algae presence, and according to the EPA 2022 National Lakes Assessment, concentrations above this threshold are considered unhealthy for arid regions such as the Salton Sea.

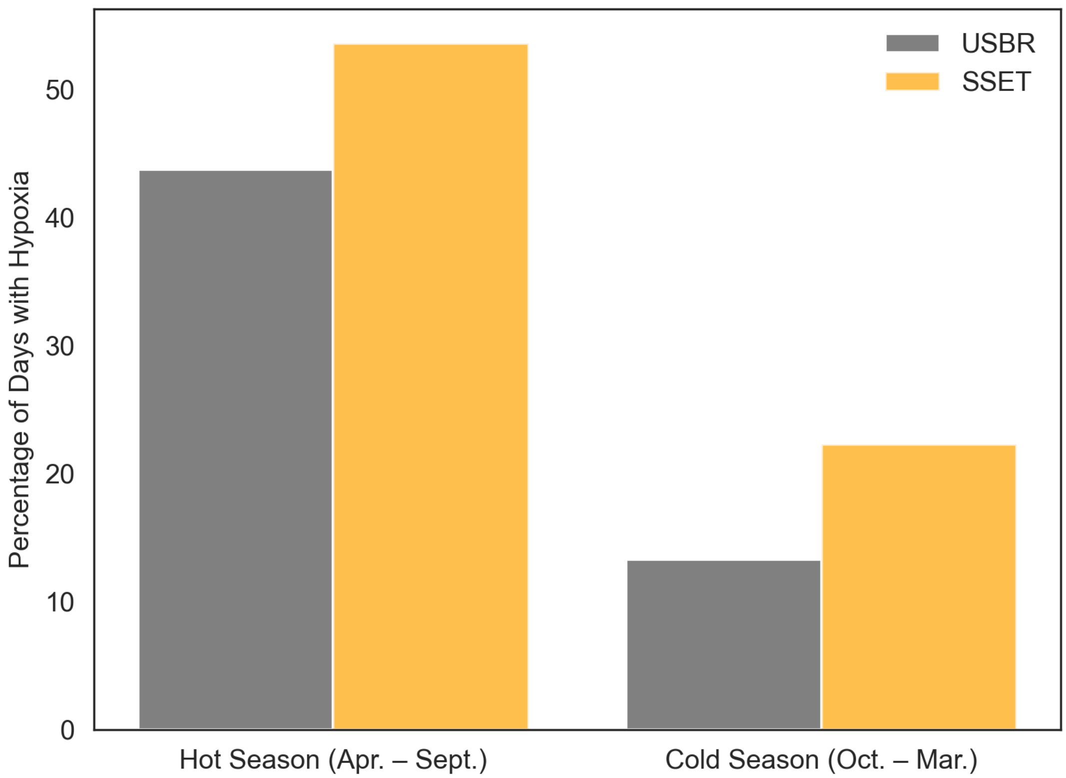
Finding 3: The Salton Sea is facing dangerously depleted oxygen levels.

The EPA defines hypoxia in the environment as oxygen concentrations below approximately 2.5 mg/L.[15] Low oxygen levels are harmful to aquatic ecosystems as they can disrupt biogeochemical processes in multicellular organisms.[16] However, hypoxia also creates low-oxygen environments in which bacteria thrive and potentially produce H_2S.[17] Previously thought to be limited to deep areas of the Salton Sea, studies have shown that hypoxia also occurs in shallow regions.[18]

Since 2004, the USBR has conducted 55 sampling events, detecting hypoxia on half of those days. In the most recent decade (2010–2020), the USBR recorded hypoxia on only

31% of their total sample days. More specifically, hypoxia occurred on 44% of the USBR hot-season sampling days (April–September) and 13% of their cold-season sampling days (October–March). In contrast, high-frequency SSET monitoring (one-minute intervals, May 2024–May 2025) found hypoxia on 54% of hot-season days and 22% of cold-season days in waters as shallow as 2 m. The gap between the values found by the USBR and those found by SSET underscores how infrequent sampling can miss many hypoxic events (Figure 4).

Figure 4. Percentage of Days with Hypoxic Conditions Detected



Note: Hypoxic conditions were detected at the SSET mooring over the course of a year (May 2024–May 2025) versus at any of the USBR's three sites over the course of 10 years (2010–2020). SSET's continuous, minute-by-minute data reveal far more hypoxia than USBR's infrequent sampling (≤4 times per year), which include only 16 hot-season (April–September) and 16 cold-season (October–March) days over a decade. In contrast, SSET recorded 166 hot-season and 175 cold-season days, with nearly a month of hot-season data lost due to instrument failure. To ensure comparability, only USBR oxygen measurements above 2 m depth are included, matching the depth at SSET's shallow site.

Finding 4: Excess nutrients drive algal blooms and hazardous H_2S levels beyond state standards.

Agricultural runoff from fertilizers introduces excess nutrients into the lake, which fuels algal blooms. As these blooms decay, bacteria decompose the organic matter, consuming oxygen in the water column. This leads to hypoxia and creates an ideal environment for H2S production. Hydrogen sulfide not only degrades water-quality but also escapes into the air, posing health risks to nearby communities. This connection between water and air-quality underscores the broader impact of nutrient pollution.

Although SSET began monitoring H_2S emissions only in late 2023, the short record already shows alarming concentrations. In 2024, H_2S levels exceeded the CARB advisory threshold of 30 ppb for 251 hours, with peaks reaching 237 ppb; most exceedances occurred in summer. In 2025, with data available only from March through July, the threshold was exceeded for 128 hours—already more than half the total hours recorded in all of 2024.

POLICY RECOMMENDATIONS

Since the adoption of the Quantification Settlement Agreement in 2003, both the State of California and the federal government have been legally contractually obligated to restore the Salton Sea and adopt the financial responsibility for its restoration. Therefore, we recommend implementing the following policies to improve the water-quality of the region.

5. **Establish and Enforce Total Maximum Daily Loads:** Total Maximum Daily Loads (TMDLs) establish regulatory limits on the amount of pollutants, such as nitrogen, that a water body can absorb while still maintaining water-quality standards. The California State and Regional Water Resources Boards (CWRB), in coordination with the Environmental Protection Agency (EPA), must prioritize the establishment, regulation, and rigorous enforcement of TMDLs in this region. Effective implementation should include:

    a. periodic water-quality measurements;
    b. verification of agricultural inputs through nitrogen fertilizer application reports;
    c. annual reports on management practices;
    d. audits of high-risk dischargers to ensure compliance.

    Enforcement should combine requirements for best management practices with fees for violations, with funds reinvested into community compensation or restoration programs. Community engagement is critical: local farmworkers and residents should play an active role in monitoring and enforcement. Programs like Alianza Coachella Valley's community science initiative exemplifies successful community accountability efforts and should be expanded and replicated across other organizations, with funding support from AB 617. Anonymous reporting mechanisms, such as texts or website submissions, can further empower the community to flag noncompliance.

6. **Community Compensation Funds:** Allocate funds from the Deficit Irrigation Program (DIP) and the Salton Sea Lithium Fund to establish a dedicated community compensation fund for residents impacted by environmental and health burdens from poor water-quality at the Salton Sea. The fund should address public health impacts arising from proximity to the lake, including respiratory illnesses linked to the interplay of water and air-quality. Eligibility should be based on proximity of home or work to the Salton Sea, type and severity of symptoms, and duration of exposure to pollutants. Disbursements should be guided by an economic analysis of the costs of environmental degradation and should support direct payouts, subsidized health insurance, construction of rural clinics, and recruitment of healthcare professionals. Legal precedents such as the Federal Coal Mine Health and Safety Act of 1969 and the Black Lung Benefits Improvement Act of 2022 demonstrate the viability of compensating communities for health impacts from environmental hazards. Partnerships with local organizations—such as Leadership Counsel for Justice & Accountability and Imperial Valley Equity & Justice—and Federally Qualified Health Centers can facilitate outreach, administration, and transparent annual reporting. By combining dedicated funding, community oversight, and targeted health interventions, this program can mitigate the socioeconomic and health impacts of water policy decisions in the Salton Sea region.

7. **Fund Nutrient Bioremediation Projects:** As the Salton Sea continues to shrink, it is critical to fund nutrient bioremediation projects to mitigate environmental and public health impacts. Funding from the pesticide mill tax, and existing sources such as the Proposition 4 Climate Bond, Salton Sea Management Program, Salton Sea Lithium Fund, and Salton Sea Conservancy Fund should be redirected toward nature-based solutions that remove excess nutrients and prevent hypoxic zones. Local indigenous tribes should have formal roles in the design and implementation of these projects to ensure culturally informed and ecologically sound approaches. The State Water Resources Control Board and EPA should provide grants to support pilot projects, with streamlined permitting to enable the launch of four projects by the end of 2026, while ensuring larger companies do not cause environmental degradation. These measures will advance community-led, science-based solutions to restore ecosystem function and protect public health in the Salton Sea region.

8. **Increase the Frequency of Water-Quality Monitoring and the Accessibility of the Data:** To effectively assess remediation efforts and track water-quality improvements at the Salton Sea, the Regional Water Quality Control Board should receive funding to increase lake-wide monitoring to at least once every two weeks, ensuring samples are collected from representative locations at both the northern and southern ends of the Sea. Access for local communities, research teams, and government agencies should be facilitated through publicly accessible, durable boat ramps at both ends, capable of withstanding fluctuating water levels. Funding from programs such as AB 617, traditionally focused on air-quality, should support

this water-quality monitoring due to the strong connection between water and air-quality. All data, particularly that collected by the Regional Water Quality Control Board, should be publicly available within a month, with provisional datasets released immediately alongside disclaimers while quality assurance is completed. Public-facing tools—including dashboards, digital outreach, and hybrid community workshops—should be used to convey data and ensure community accountability.

NOTES

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ABOUT THE AUTHORS

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Her research focuses on observational methods and utilizes field data to enhance our understanding of critical environmental challenges. Community involvement is central to both her research and its implementation.Born and raised in Puerto Rico, Arzeno-Soltero is particularly passionate about collaborating on issues that affect Latinx communities.