

# SCCWRP's fact sheet series

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# Background

- We're producing a fact sheet every quarter for you
- You're using the fact sheets to supplement conversations you're having with your board, staff, partners, etc.
- We've published 5 so far
- The next fact sheet on HABs is ready for your review today

## Rapid beach testing methods

**SCCWRP FACT SHEET**  
**Using DNA technology to protect beachgoers from fecal contamination**  
DNA-based methods provide faster, more insightful information about when it's safe vs. risky to enter the water

For decades, the public health community has tested beach water for fecal contamination using established bacterial culturing methods. But advances in DNA technology are paving the way for faster, more insightful ways to assess water quality and warn beachgoers when it's potentially unsafe to enter. In 2022, San Diego County became the first coastal community in the nation to rely on bacterial culturing in favor of a DNA-based method.

### Key advantages of DNA technology

The traditional way to test beach water for fecal contamination is via cell culturing, where bacteria cells from a water sample are grown in a laboratory overnight and then analyzed. DNA-based methods, by contrast, focus on analyzing the bacteria cells' DNA.

- **Faster:** Whereas cell culturing typically takes 24-72 hours after beach water samples reach a laboratory, DNA methods can provide same-day results. Speed is of the essence when it comes to protecting the health of beachgoers, especially following unexpected, transient sewage spills. Public health agencies need to close beaches and/or post warning signs as soon as a potential risk to human health has been confirmed – and then reopen beaches and/or rescind advisories as soon as the risk has passed.
- **More insightful:** Cell culturing cannot determine if fecal contamination originated in the gut of a human or another animal, such as a bird or dog. By contrast, DNA methods can make this distinction. These additional insights help the environmental management community prioritize remedial actions that represent the greatest threat to public health. It's primarily human feces that sicken swimmers and surfers.)

### DNA methods agree with culturing methods

For DNA methods to be approved as a replacement for culturing methods, the two methods must produce results that lead public health agencies to take consistently similar actions to close beaches and/or post warning signs. Scientists have conducted extensive side-by-side testing of the two types of methods across Southern California. The testing found about 90% agreement in the beach closure and notification decisions that public health agencies make based on the two methods.

When decision-making differs for a beach, scientists have multiple ways to probe why and determine which set of results is the more appropriate predictor of illness risk.

**SCCWRP FACT SHEET**  
**Modeling as a tool to support coastal water-quality decisions**  
A primer on how computer modeling is used to understand the effects of discharging nutrients to Southern California's ocean

When coastal communities face water-quality problems, they often struggle to understand the extent of the problem across space and time. Environmental monitoring programs can provide some insights, but only for a limited number of sites at discrete time points.

Moreover, as communities identify possible solutions over time to solve water-quality problems, they need reassurance they'll yield tangible environmental benefits – before investing millions or even billions of dollars in a particular solution. Modeling programs can quantify the success of these solutions once implemented, but do not provide insights about the likelihood of success for solutions that have yet to be implemented.

### Modeling helps communities make informed choices

For decades, managers have relied on computer modeling to generate a more comprehensive view of coastal ecosystem health and to evaluate if proposed interventions to protect water quality are effective. Through modeling, stakeholders can:

- Weigh the benefits vs. costs of different possible interventions
- Consider the risk of taking no action vs. taking action that turns out to be wrong or inadequate
- Use a common set of facts and data to reach a consensus on the best course of action

### Examples: Modeling informing decisions

Managers routinely use proven computer models as a basis for taking action:

- During hurricanes, weather forecasting models help public officials determine when and where to issue evacuation orders to move millions of people to safety.

**SCCWRP FACT SHEET**  
**Tracking the health of aquatic ecosystems through regional monitoring**  
Southern California managers rely on regional monitoring to understand changing environmental conditions

Regional monitoring is a type of environmental monitoring that focuses on holistic evaluation of ecosystems across time and space. Unlike site-specific monitoring that tends to focus on smaller areas, regional monitoring often calls on multiple agencies with overlapping responsibilities for protecting ecosystem health to pool their resources and work together on more ambitious, comprehensive scientific investigations. In Southern California, the insights provided by regional monitoring help environmental managers to better direct resources and maintain focus on the areas and issues that pose the greatest risks to ecosystem integrity.

### Complement to site-specific monitoring

Southern California's water-quality management community spends tens of millions of dollars every year to monitor aquatic environments affected by pollution and other human-caused stresses. Much of this monitoring is focused on understanding the ecological effects of specific human activities, such as wastewater and stormwater discharges. While this type of monitoring provides critical management insights, the data cannot be combined to produce a holistic picture of regional ecosystem health. Regional monitoring helps fill this data gap. Through regional monitoring, managers can contextualize site-specific monitoring insights and answer big picture questions like:

- Which water bodies in Southern California are most polluted?
- Is the overall condition of Southern California's water bodies declining or improving?
- How safe is it to swim at Southern California beaches and consume fish from Southern California waters?

### Signature regional monitoring programs

Southern California is home to two expansive, cyclical regional monitoring programs that probe multiple aspects of regional ecosystem health.

- **Southern California Right Regional Monitoring Program:** Conducted in five-year cycles, the Right Program examines the health of about 1,500 square miles of coastal waters and includes more than 90 participating organizations. The seventh and newest cycle – Right 23 – features seven major study elements: Sediment Quality, Water Quality, Harmful Algal Blooms, Trash, Microplastics, Microbiology, and Submerged Aquatic Vegetation.



Southern California offshore sediment and a California halibut

- **SAC Regional Watershed Monitoring Program:** Founded in 2009 by the Southern California Stormwater Monitoring Coalition (SMC), this cyclical five-year program probes multiple aspects of the ecological condition of more than 4,000 miles of streams that drain to Southern California's coastal ocean. The SMC's stream survey serves as the Right program's freshwater counterpart, and is aligned with California's statewide stream assessment program.



A field crew for the SAC stream monitoring program

## Water-quality modeling

SCCWRP's management value

**SCCWRP FACT SHEET**  
**How SCCWRP adds value to aquatic ecosystems management**  
The applied-science research agency builds a rigorous technical foundation for management decision-making

The Southern California Coastal Water Research Project (SCCWRP) is an applied sciences institute working to incorporate rigorous, fully vetted research into the decisions and actions of Southern California's environmental management community. Since its founding as a public-sector research agency in 1969, SCCWRP has been developing strategies, tools, and technologies. But SCCWRP's research and analytical services also



**SCCWRP by the numbers**  
The fact sheet starts  
in science departments  
\$12 million annual budget

### SCCWRP member agencies

**Watershed treatment agencies**  
City of Los Angeles Bureau of Sanitation  
Orange County Sanitation District  
City of San Diego Public Utilities Department

**Watershed management agencies**  
San Diego County Water Control District  
San Diego County Public Works  
San Diego County Watershed Protection Agency  
Ventura County Watershed Protection Agency

**Water-quality regulatory agencies**  
U.S. Environmental Protection Agency  
California State Water Resources Control Board  
San Diego Regional Water Quality Control Board  
San Diego Regional Water Quality Control Board

**Natural resources agency**  
California Ocean Protection Council

### end monitoring's reach

Spring can serve as an effective bioassessment monitoring. But beyond monitoring to places and past monitoring isn't visible or



California oyster, a species of special concern



Harmful algal bloom in a Southern California lake



Pacific halibut, one of many common species targeted during regional fisheries stock assessments

eDNA monitoring

Regional monitoring

# HABs fact sheet

- CTAG helped us refine the HABs fact sheet last month
  - CTAG has decided the revised version is ready for your review
- We've already received some requested edits from you
  - Are you ready to approve the fact sheet today with minor edits?

## Harmful algal blooms

SCCWRP FACT SHEET **DRAFT**

### Protecting ecosystems and humans from harmful algal blooms (HABs)

*Environmental managers are developing strategies, monitoring programs and modeling tools to gain the upper hand on managing toxic HABs*

Harmful algal blooms (HABs) are overgrowths of algae and cyanobacteria that degrade water quality and harm ecosystems. Although algae and cyanobacteria are part of a balanced ecosystem, excessive algal growth can block sunlight and deplete oxygen levels, triggering events like mass fish deaths. A major consequence of HABs is the potent toxins HABs can produce; these toxins can sicken and kill animals, contaminate food webs, and cause illness in humans who drink or swim in contaminated waters. In California, both freshwater and coastal marine waters are being adversely affected by HABs. Researchers are working to help environmental managers understand:

- » When, where and why toxin-producing HABs are occurring
- » How to more accurately forecast when and where HABs will produce toxins

HABs often pose a seasonal threat, forming in late spring or early summer and dissipating by fall. However, blooms can occur year-round, and HAB toxins can persist in water bodies for months after the blooms have disappeared. The most common types of toxin-producing HABs in Southern California are:

#### How toxic HABs manifest in Southern California

**Marine environments**

- **Pseudo-nitzschia blooms:** The diatom *Pseudo-nitzschia* can produce a neurotoxin known as domoic acid that can trigger mass strandings and deaths of sea lions and other marine mammals and birds. When humans consume contaminated seafood, domoic acid can cause gastrointestinal illness and short-term memory loss. Domoic acid can persist in seafloor sediments and sediment-dwelling organisms for months to years after a bloom, extending the duration of a bloom's impacts.
- **Red tides:** Some species of dinoflagellates and raphidophytes taint marine and estuarine waters shades of red or brown during events known as red tides; some red tides are bioluminescent. While some red tides are benign, others produce toxins that cause widespread fish kills and contaminate shellfish consumed by humans.

**Freshwater environments**

- **CyanoHABs:** Blooms of cyanobacteria in lakes, streams and other freshwater and estuarine environments are known as cyanoHABs. They form thick mats, either along the surface or bottom of water bodies, and can produce cyanotoxins that harm wildlife and humans. Cyanotoxins can be transported to coastal marine waters by streams and runoff, extending their impact across the land-sea interface.

**HAB monitoring programs in California**

- **California HAB Monitoring and Alert Program (HABMAP):** Founded in the mid-2000s, HABMAP provides weekly HAB monitoring at 10 coastal marine stations statewide.
- **California Freshwater and Estuarine HAB (CHAE) Program:** The CHAE program was formalized by the Water Boards in 2020 to coordinate monitoring and assessment of inland HABs statewide.
- **Shellfish Biotoxin Monitoring:** Began in the 1990s, bottom monitoring is California's longest-running HAB monitoring program. It focuses on protecting humans from HAB toxins when they consume coastal shellfish and other seafood.

**HABs studies via Bight regional monitoring**

Since 2008, the Southern California Bight Regional Monitoring Program has been conducting foundational regional studies illuminating where, when and why algal blooms are occurring. In 2018, Bight '18 found that HAB toxins were detected in 54% of all seafloor sediment in the Southern California Bight. For Bight '23, the program is documenting the degree to which HAB toxins have contaminated local shellfish that humans consume.

A field crew collects samples during a HAB event in San Diego River in northern San Diego County. HABs can taint water vibrant shades of green, blue and red.



# Future fact sheet topics

- Last June, you used ranked-choice voting to prioritize the next 6 fact sheets
  - PFAS is next quarter's topic

## CTAG's priorities for future fact sheet topics

1. Regional monitoring ✓
2. Harmful algal blooms ✓
3. PFAS
4. Microplastics
5. HF183
6. Ocean acidification and hypoxia

# Next steps

- We'll produce the PFAS fact sheet next quarter
- We will publish the HABs fact sheet to you as soon as you've signed off
  - We will email you the final version + post to our website
- Keep up in the loop about how you're using the fact sheets
  - We are producing these documents for your benefit