SCCWRP's fact sheet series

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Commission Meeting

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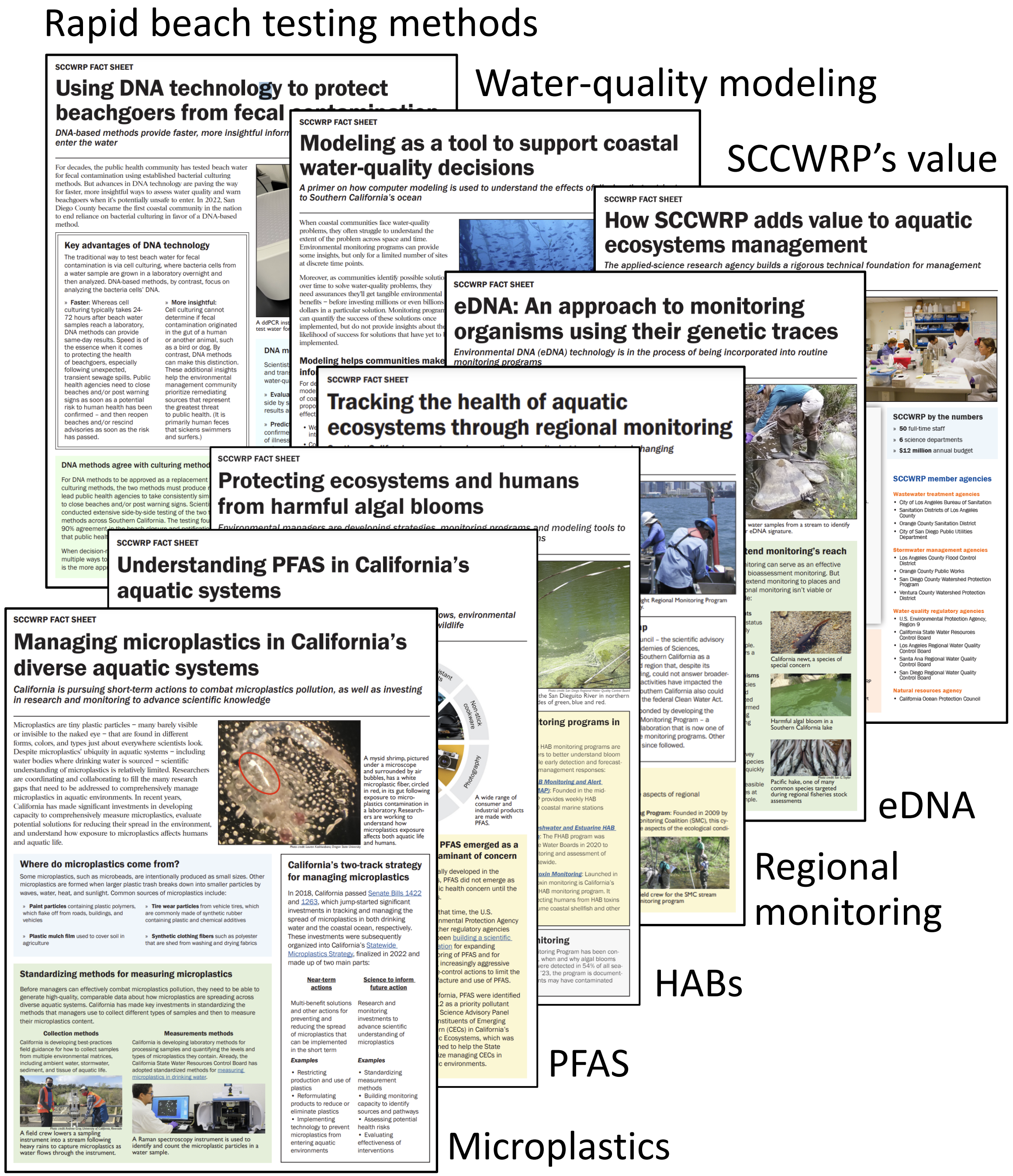
Background

- 2 fact sheets have been drafted for your review today
  - We spend 2-4 quarters working with CTAG on each fact sheet
- CTAG decides when a fact sheet is ready to be advanced to you
  - We have published 8 fact sheets so far

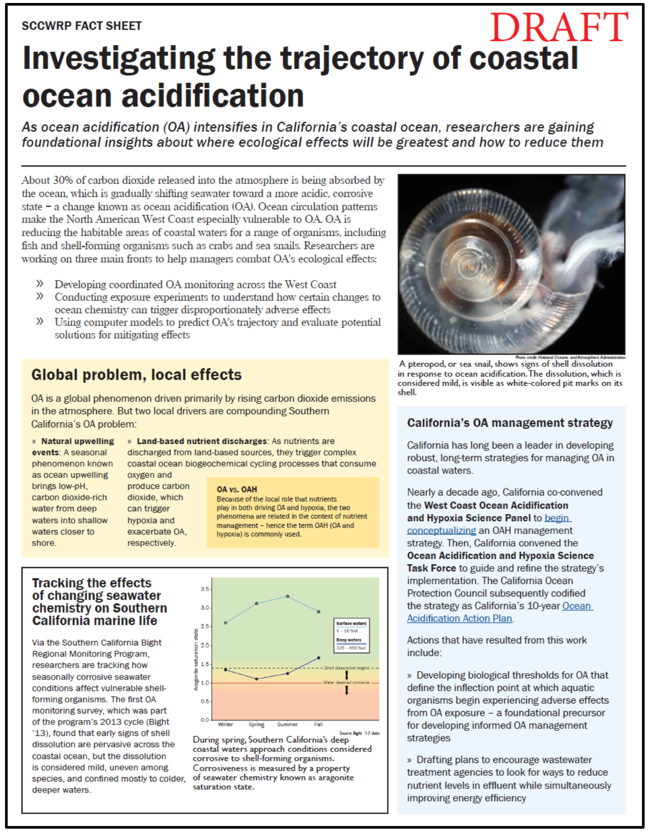


OA fact sheet

- CTAG worked with us over 3 quarters to craft our ocean acidification fact sheet

- Can we get approval today?

OA fact sheet (draft)



SCCWRP FACT SHEET

DRAFT

Investigating the trajectory of coastal ocean acidification

As ocean acidification (OA) intensifies in California's coastal ocean, researchers are gaining foundational insights about where ecological effects will be greatest and how to reduce them

About 30% of carbon dioxide released into the atmosphere is being absorbed by the ocean, which is gradually shifting seawater toward a more acidic, corrosive state – a change known as ocean acidification (OA). Ocean circulation patterns make the North American West Coast especially vulnerable to OA. OA is reducing the habitable areas of coastal waters for a range of organisms, including fish and shell-forming organisms such as crabs and sea snails. Researchers are working on three main fronts to help managers combat OA's ecological effects:

» Developing coordinated OA monitoring across the West Coast
» Conducting exposure experiments to understand how certain changes to ocean chemistry can trigger disproportionately adverse effects
» Using computer models to predict OA's trajectory and evaluate potential solutions for mitigating effects

Photo credit: National Oceanic and Atmospheric Administration

A pteropod, or sea snail, shows signs of shell dissolution in response to ocean acidification. The dissolution, which is considered mild, is visible as white-colored pit marks on its shell.

Global problem, local effects

OA is a global phenomenon driven primarily by rising carbon dioxide emissions in the atmosphere. But two local drivers are compounding Southern California's OA problem:

» **Natural upwelling events**: A seasonal phenomenon known as ocean upwelling brings low-pH, carbon dioxide-rich water from deep waters into shallow waters closer to shore.

» **Land-based nutrient discharges**: As nutrients are discharged from land-based sources, they trigger complex coastal ocean biogeochemical cycling processes that consume oxygen and produce carbon dioxide, which can trigger hypoxia and exacerbate OA, respectively.

OA vs. OAH
Because of the local role that nutrients play in both driving OA and hypoxia, the two phenomena are related in the context of nutrient management – hence the term OAH (OA and hypoxia) is commonly used.

Tracking the effects of changing seawater chemistry on Southern California marine life

Via the Southern California Bight Regional Monitoring Program, researchers are tracking how seasonally corrosive seawater conditions affect vulnerable shell-forming organisms. The first OA monitoring survey, which was part of the program's 2013 cycle (Bight '13), found that early signs of shell dissolution are pervasive across the coastal ocean, but the dissolution is considered mild, uneven among species, and confined mostly to colder, deeper waters.

During spring, Southern California's deep coastal waters approach conditions considered corrosive to shell-forming organisms. Corrosiveness is measured by a property of seawater chemistry known as aragonite saturation state.

California's OA management strategy

California has long been a leader in developing robust, long-term strategies for managing OA in coastal waters.

Nearly a decade ago, California co-convened the **West Coast Ocean Acidification and Hypoxia Science Panel** to begin conceptualizing an OAH management strategy. Then, California convened the **Ocean Acidification and Hypoxia Science Task Force** to guide and refine the strategy's implementation. The California Ocean Protection Council subsequently codified the strategy as California's 10-year Ocean Acidification Action Plan.

Actions that have resulted from this work include:

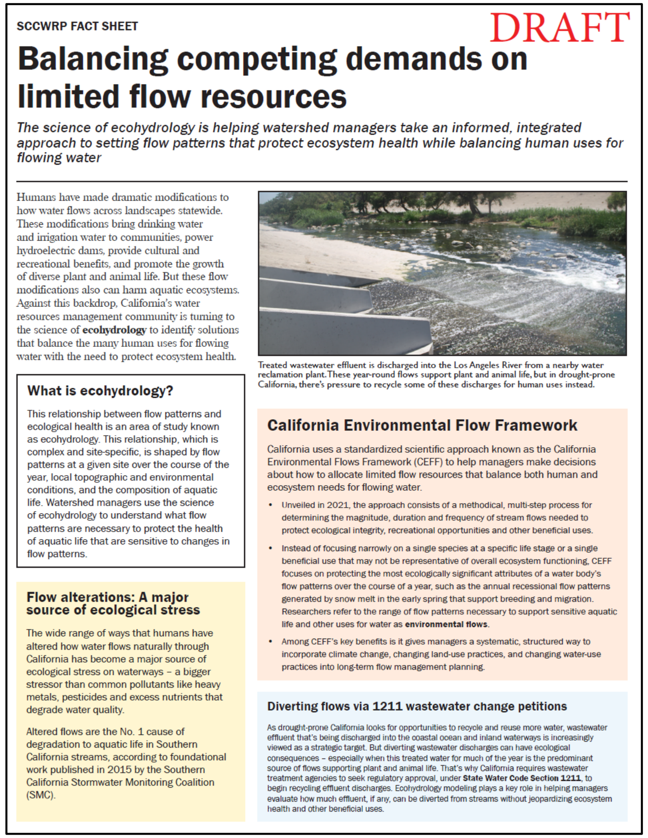
» Developing biological thresholds for OA that define the inflection point at which aquatic organisms begin experiencing adverse effects from OA exposure – a foundational precursor for developing informed OA management strategies

» Drafting plans to encourage wastewater treatment agencies to look for ways to reduce nutrient levels in effluent while simultaneously improving energy efficiency

Ecohydrology fact sheet

- CTAG worked with us over 2 quarters to craft our ecohydrology fact sheet
- We received a Commissioner request to rework one section
  - We'll bring this fact sheet back to you next quarter

Ecohydrology fact sheet (draft)



SCCWRP FACT SHEET

DRAFT

Balancing competing demands on limited flow resources

The science of ecohydrology is helping watershed managers take an informed, integrated approach to setting flow patterns that protect ecosystem health while balancing human uses for flowing water

Humans have made dramatic modifications to how water flows across landscapes statewide. These modifications bring drinking water and irrigation water to communities, power hydroelectric dams, provide cultural and recreational benefits, and promote the growth of diverse plant and animal life. But these flow modifications also can harm aquatic ecosystems. Against this backdrop, California's water resources management community is turning to the science of **ecohydrology** to identify solutions that balance the many human uses for flowing water with the need to protect ecosystem health.

Treated wastewater effluent is discharged into the Los Angeles River from a nearby water reclamation plant. These year-round flows support plant and animal life, but in drought-prone California, there's pressure to recycle some of these discharges for human uses instead.

What is ecohydrology?

This relationship between flow patterns and ecological health is an area of study known as ecohydrology. This relationship, which is complex and site-specific, is shaped by flow patterns at a given site over the course of the year, local topographic and environmental conditions, and the composition of aquatic life. Watershed managers use the science of ecohydrology to understand what flow patterns are necessary to protect the health of aquatic life that are sensitive to changes in flow patterns.

Flow alterations: A major source of ecological stress

The wide range of ways that humans have altered how water flows naturally through California has become a major source of ecological stress on waterways – a bigger stressor than common pollutants like heavy metals, pesticides and excess nutrients that degrade water quality.

Altered flows are the No. 1 cause of degradation to aquatic life in Southern California streams, according to foundational work published in 2015 by the Southern California Stormwater Monitoring Coalition (SMC).

California Environmental Flow Framework

California uses a standardized scientific approach known as the California Environmental Flows Framework (CEFF) to help managers make decisions about how to allocate limited flow resources that balance both human and ecosystem needs for flowing water.

- Unveiled in 2021, the approach consists of a methodical, multi-step process for determining the magnitude, duration and frequency of stream flows needed to protect ecological integrity, recreational opportunities and other beneficial uses.
- Instead of focusing narrowly on a single species at a specific life stage or a single beneficial use that may not be representative of overall ecosystem functioning, CEFF focuses on protecting the most ecologically significant attributes of a water body's flow patterns over the course of a year, such as the annual recessional flow patterns generated by snow melt in the early spring that support breeding and migration. Researchers refer to the range of flow patterns necessary to support sensitive aquatic life and other uses for water as **environmental flows**.
- Among CEFF's key benefits is it gives managers a systematic, structured way to incorporate climate change, changing land-use practices, and changing water-use practices into long-term flow management planning.

Diverting flows via 1211 wastewater change petitions

As drought-prone California looks for opportunities to recycle and reuse more water, wastewater effluent that's being discharged into the coastal ocean and inland waterways is increasingly viewed as a strategic target. But diverting wastewater discharges can have ecological consequences – especially when this treated water for much of the year is the predominant source of flows supporting plant and animal life. That's why California requires wastewater treatment agencies to seek regulatory approval, under **State Water Code Section 1211**, to begin recycling effluent discharges. Ecohydrology modeling plays a key role in helping managers evaluate how much effluent, if any, can be diverted from streams without jeopardizing ecosystem health and other beneficial uses.

Future fact sheet topics

- Our next fact sheet topic is coastal resiliency
  - Do you still want to move forward with this topic?

- Are you still using these fact sheets?
  - We produce these documents because you requested them

Topics for SCCWRP fact sheets
(Commission-approved list)

1. Rapid beach testing methods ✓
2. Water-quality modeling ✓
3. SCCWRP's value ✓
4. eDNA ✓
5. Regional monitoring ✓
6. Harmful algal blooms ✓
7. PFAS ✓
8. Microplastics ✓
9. Ocean acidification ***(today)***
10. Ecohydrology ***(today)***
11. HF183 ***(in progress)***
12. Coastal resiliency
13. Wastewater-based disease surveillance
14. Bioassays
15. Eutrophication
16. Bioassessment