CLIMATE CHANGE & THE OCEAN

Ocean Acidification & Deoxygenation

Matt O'Malley

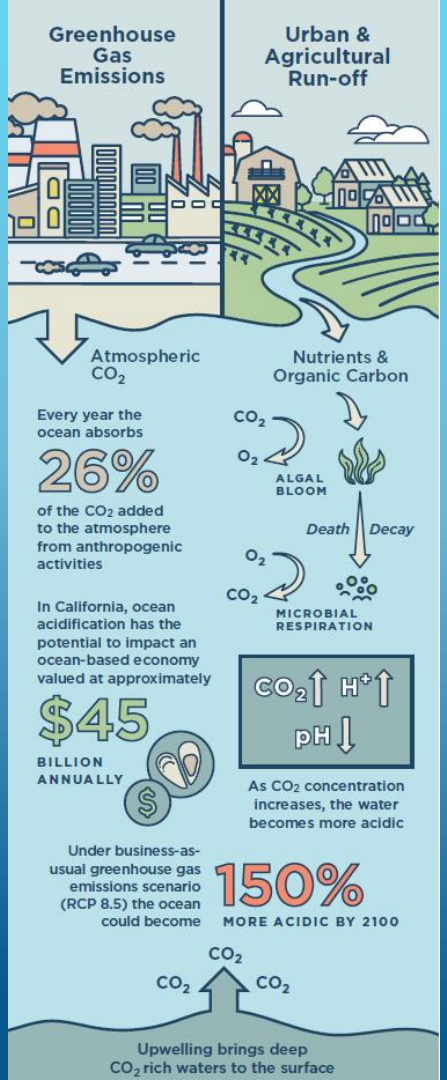
San Diego Coastkeeper

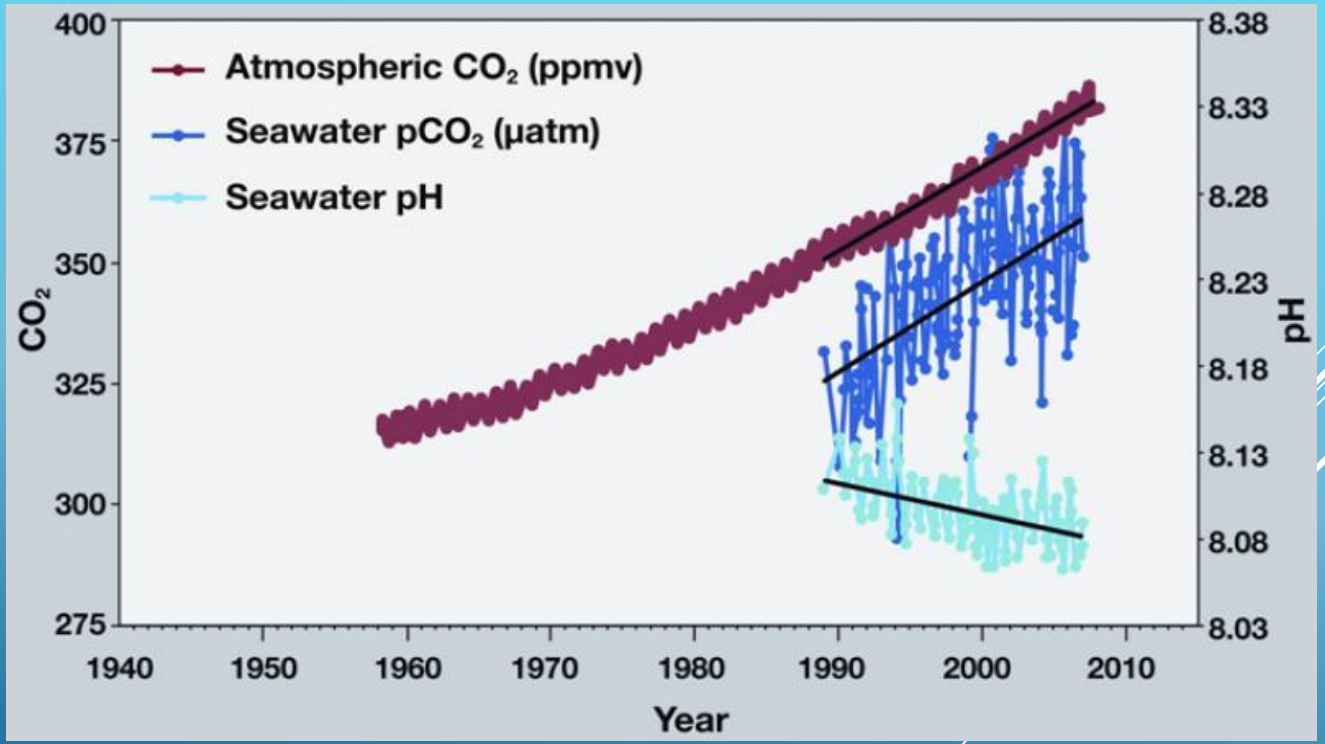
The ocean acts as a carbon "sink", absorbing up to 30% of the CO_2 released into the atmosphere. As CO_2 levels rise, so do the levels in the ocean.

This uptake helps buffer terrestrial heating but also causes the pH levels in the ocean to lower, causing ocean acidification.

Warming waters cause also deoxygenation and hypoxia.

Urban and Ag discharges lead to further acidification.


Greenhouse Gas Emissions
Urban & Agricultural Run-off
Atmospheric CO_2
Nutrients & Organic Carbon
Every year the ocean absorbs
26%
of the CO_2 added to the atmosphere from anthropogenic activities
CO_2
O_2
ALGAL BLOOM
Death
Decay
O_2
CO_2
MICROBIAL RESPIRATION
In California, ocean acidification has the potential to impact an ocean-based economy valued at approximately
$45
BILLION ANNUALLY
CO_2 ↑ H^+ ↑
pH ↓
As CO_2 concentration increases, the water becomes more acidic
Under business-as-usual greenhouse gas emissions scenario (RCP 8.5) the ocean could become
150%
MORE ACIDIC BY 2100
CO_2
CO_2
CO_2
Upwelling brings deep CO_2 rich waters to the surface


Atmospheric CO_2 (ppmv)
Seawater pCO_2 (µatm)
Seawater pH
CO_2
pH
400
375
350
325
300
275
8.38
8.33
8.28
8.23
8.18
8.13
8.08
8.03
1940
1950
1960
1970
1980
1990
2000
2010
Year

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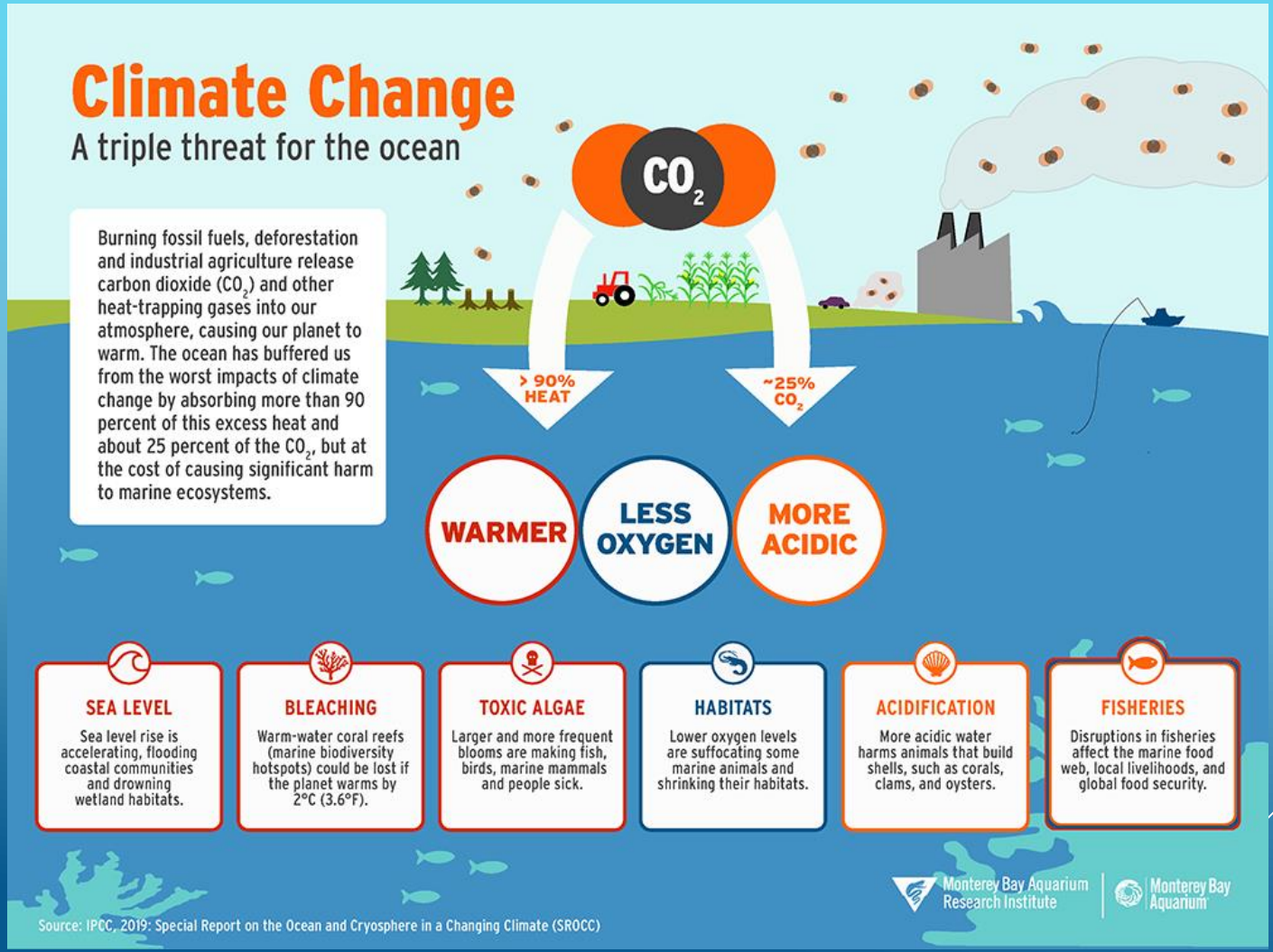

The New York Times

The World's Oceans Are in Danger, Major Climate Change Report Warns

The warming world is disrupting aquatic life and ocean patterns, with dire global consequences. Scott McIntyre for The New York Times

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"Ocean warming and acidification, loss of oxygen, and changes in nutrient supplies are already affecting the distribution and abundance of marine life in coastal areas, in the open ocean, and at the sea floor".

-Sept 2019 IPCC report

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OA binds up carbonate ions and makes them less abundant – ions that corals, oysters, mussels, and other shelled organisms need to build shells and skeletons.

Northwest Oyster Die-offs Show Ocean Acidification Has Arrived

The acidification of the world's oceans from an excess of CO_2 has already begun, as evidenced recently by the widespread mortality of oyster larvae in the Pacific Northwest. Scientists say this is just a harbinger of things to come if greenhouse gas emissions continue to soar.

BY ELIZABETH GROSSMAN · NOVEMBER 21, 2011

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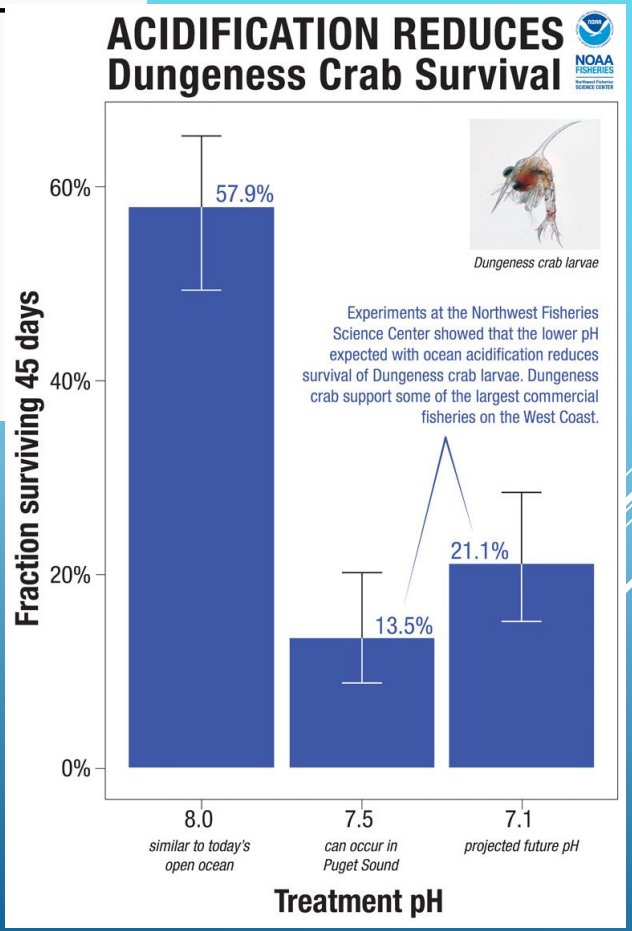

WHAT'S CA DOING ABOUT IT?

CALIFORNIA'S OA PLAN

Adopted Oct 2018, a 10-year vision for addressing OA and pragmatic actions towards that goal

Lays out strategies and actions to:

- identify and prepare for risks/impacts
- reduce causes of OA
- improve resilience of vulnerable groups
- minimize harmful effects

CALIFORNIA'S OA PLAN

- Conduct statewide vulnerability assessment
- Target investments in monitoring to inform decisions
- Integrate OA into state policies, planning, operations
- Reduce pollution that exacerbates OA
- Restore and enhance seagrass meadows, kelp forests, and salt marshes
- Evaluate shellfish aquaculture and fisheries approaches that can help

SOCAL'S ROLE

- SCCWRP modeling project to determine impact of local, non-atmospheric sources

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SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT

Applying next-generation science to aquatic ecosystems management

A PUBLIC AGENCY

Research Areas

Bioassessment Ecohydrology Eutrophication
Climate Change Sediment Quality Emerging Contaminants
Microbial Water Quality Regional Monitoring

Home » News » **Modeling shows nutrient discharges can influence coastal acidification, hypoxia**

Modeling shows nutrient discharges can influence coastal acidification, hypoxia

Posted August 5, 2019

A computer modeling initiative to understand how Southern California's coastal ocean will be affected by ocean acidification and hypoxia has shown that land-based sources of nutrients can have a measurable effect on

More related news

Recreational beneficial uses analysis completed for L.A. River environmental flows study

Dynamic exposure lab built to replicate fluctuating environmental conditions

Bight '18 pilot study to assess how acidification is impacting marine calcifiers

Bight '18 HABs study preparing to track

INITIAL STUDY FINDINGS

"Land-based sources of nutrients can have a measurable effect on seawater chemistry in nearshore waters", leading to acidification and hypoxia

In the Southern California Bight, land-based nutrients are being introduced mainly via discharges of treated wastewater effluent through ocean outfalls

These hot spots are persistent, & don't just disperse into the surrounding waters, and directly impact the marine communities around outfalls

PART OF THE SOLUTION (REGULATORY)

CA Coastkeeper Alliance advocating for OA water quality objective based on this study.

Study is not yet finalized, but data shows anthropogenic discharges associated with acidification and hypoxia

State Water Board has committed to develop OA WQO once study is finalized and “science is ready”.

PART OF THE SOLUTION (REGULATORY)

CCKA, NRDC, and others advocating for elimination of 95% of ocean wastewater discharges by 2040

Advocating for WWTP to incorporated denitrification into their treatment

PART OF THE SOLUTION (NATURE-BASED)

Coastal wetlands, kelp, eelgrass, salt marsh restoration and protection serves to sequester CO_2 stabilize and filter nutrients and organic carbon

These areas serve as critical nursery habitat for fish species and provide additional ecosystem services

Advocating for a Coastal Wetland Policy that creates a net gain of ecologically functioning wetlands

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