OCEAN ACIDIFICATION

Tackling a Global Challenge in Washington State

COLLEGE OF THE ENVIRONMENT
UNIVERSITY *of* WASHINGTON

What is Ocean Acidification?

Across the globe, carbon emissions from the combustion of fossil fuels are causing changes to our atmosphere. But it's not only our atmosphere that is affected—our oceans are feeling it too through ocean acidification.

Worldwide, the ocean provides an invaluable service to the planet by absorbing about 28% of the carbon dioxide produced by human activities. Once absorbed by the ocean, this carbon dioxide undergoes a series of reactions that change seawater chemistry. As a result, the surface ocean has become about 30% more acidic over the past 250 years.

Ocean Acidification Science: What We Know

We know that the ocean's chemistry has changed and will continue to change.

- Ocean acidification has been well documented through long-term observations spanning decades, and has been attributed to human-generated additions of carbon dioxide to the atmosphere that dissolve into the ocean.
- The average seawater acidity has already risen by about 30% globally in the surface waters of all the ocean basins.
- Natural and human-derived contributions of carbon dioxide combine to cause the effects we observe as ocean acidification.
- Ocean acidification from human-generated carbon dioxide has increased the frequency, intensity, and duration of harmful conditions.

These changes are rapid and will continue for decades or centuries, and they affect the organisms and ecosystems we care about.

- Small changes in the environment can cause large responses among living organisms.
- Shelled organisms, including oysters and scallops in the Pacific Northwest, are negatively affected. This has consequences for both the marketplace and for ecosystem health, because animals such as oysters help to maintain water quality.
- Sources of food for economically important species are vulnerable. For example, pteropods—small, shelled snails that feed juvenile salmon—are negatively affected by ocean acidification.

These changes matter because they affect the people and economies connected to the ocean, in the Pacific Northwest and across the globe.

Why Care About Ocean Acidification?

Ocean acidification threatens how marine ecosystems work, and that matters to people. As ocean acidification intensifies, the availability of carbonate ion—a key component used by animals like corals and shellfish to build their calcium carbonate shells and skeletons—becomes more scarce. In Washington, the acidified waters can become corrosive to microscopic animals—like the larvae of oysters—which are important to the health of our marine ecosystems and to the people who depend on them for food and income. Also, certain plankton that support the ocean food web are affected.

Ocean Acidification Affects Washington State

Washington state is particularly vulnerable to ocean acidification because of our location combined with other global, natural, and human-driven factors. These factors include:*

- The amount of global carbon dioxide in our atmosphere.
- Upwelling of nutrient-rich—and often corrosive—waters off of our coast.
- High rates of plankton growth that ultimately reduce the oxygen content of local waters.
- Human activities causing runoff of nutrients and other pollutants from our watersheds and cities into Puget Sound and coastal waters.
- Industrial emissions of acidic gases other than carbon dioxide.

*** In isolation, any one of these factors may not tip the balance—but when added together they make our waters more susceptible to ocean acidification.**

Ocean Acidification Science: What We Are Working On

The Washington Ocean Acidification Center at the UW College of the Environment is leading the region in five priority areas as they relate to Washington:

- Foster water quality monitoring at the six existing shellfish hatcheries in Washington state.
- Work with federal, state, and local scientists to establish an expanded and sustained ocean acidification monitoring network to measure trends in local acidification conditions and related biological responses.
- Create the ability to make short-term forecasts of corrosive conditions.
- Conduct laboratory studies to assess the causes and effects of ocean acidification, alone and in combination with other stressors, on Washington's species and ecosystems.
- Investigate and develop commercial-scale water treatment methods or hatchery designs to protect larvae from corrosive seawater.

Scientists at the UW are working with partners in Washington state, along the West Coast, and around the world to improve our knowledge of ocean acidification so that we can reduce its harmful effects on people and ocean ecosystems.

About the Washington Ocean Acidification Center

The Washington Ocean Acidification Center is part of the UW College of the Environment. It was developed as recommended by the Blue Ribbon Panel on Ocean Acidification and under direction from the Washington State Legislature and Governor Inslee. The Center connects researchers, policymakers, industry, and others to advance the science of ocean acidification and provides a foundation for proactive strategies and policies to protect marine ecosystems and the people connected to them.

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For more information about the Washington Ocean Acidification Center, visit **coenv.uw.edu/oacenter** or email at **woac@uw.edu**