



State of Ocean Acidification in Washington

A report of ocean acidification activities occurring in Washington State

Developed by the Marine Resources Advisory Council
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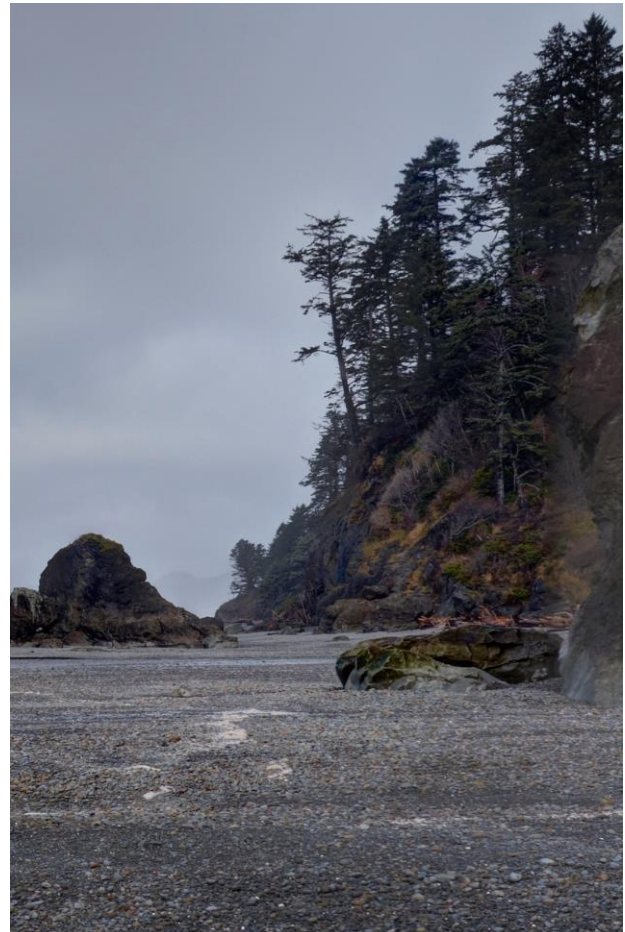
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A message from the MRAC Chair

Ocean acidification is actively affecting marine waters and resources in Washington State, threatening our economy, coastal communities, and quality of life.

The Marine Resources Advisory Council (MRAC) and the Washington Ocean Acidification Center are leading the defense, developing science-based policy and research solutions to fight back against ocean acidification. The MRAC's membership includes legislative, executive, and elected officials, tribes, nongovernmental organizations, and the private sector. Representatives from academic institutions and federal agencies are also participating.

As the chair of MRAC, I am focused on ensuring we take ocean acidification head on, leveraging science to implement solutions on the ground. I have worked closely with the Washington Ocean Acidification Center at the University of Washington to ensure support for the research necessary to make good policy decisions. MRAC has worked to maintain a sustainable, coordinated focus on increasing our state's ability to address the impacts of ocean acidification on Washington's marine environment, its coastal communities, and its economy.

Washington is a leader in fish and shellfish production. Shellfish alone bring an estimated \$270 million annually to our economy. We know that ocean acidification is a global scale change in the basic chemistry of the oceans that is underway now as a result of the increased carbon dioxide in the atmosphere. The basic chemistry is well understood and not in dispute. Ocean acidification creates a condition that is corrosive for shellfish and other species that depend on calcium carbonate shells. As these conditions worsen, we see effects on shellfish production and throughout the marine food web. Our understanding of the impacts of ocean acidification is still incomplete as our marine waters continue to change, which is why the important research work of the Center and researchers up and down the West Coast is so critically needed.

We have taken big strides to address ocean acidification over the last year. Implementation of the Blue Ribbon Panel on Ocean Acidification recommendations are underway and have already helped develop a clearer picture of ocean acidification and its impacts. Continuing our work is necessary and is vital to protect resources important to us all.

I want the work of MRAC and Washington State to be heard as a rallying cry against ocean acidification. We will do what's needed to achieve success. Like our shellfish farmers, tribes, and researchers across the state, all Washingtonians need to hear the message, and support taking action. We can be leaders at home, along the coast, and internationally as we support our culture, economy, and environment.

Sincerely,

Martha Kongsgaard

Marine Resources Advisory Council Chair

What can Washington do to combat ocean acidification?

Washington is the country's leading producer of farmed oysters, clams, and mussels. Recognizing the risks of ocean acidification to Washington, Governor Christine Gregoire created the Washington State Blue Ribbon Panel on Ocean Acidification (the Panel) in 2012.

Washington became a leader in the nation by looking at what a state could do to address ocean acidification. The Panel recommended 42 actions that collectively form a comprehensive strategy for addressing ocean acidification in Washington's marine waters. The work of the Panel is well known, inspiring other states to follow our lead in developing regional action plans to address ocean acidification. The full Panel report can be found at www.ecy.wa.gov/water/marine/oa/2012panel.html.

How can we ensure action is taken against ocean acidification?

The Panel's recommendations established a blueprint for addressing ocean acidification in Washington State. Yet, it did not specify how the strategy should be implemented, so in 2013 the state legislature established the Marine Resources Advisory Council (MRAC). The MRAC is tasked with:

- Maintaining a sustainable coordinated focus on ocean acidification;
- Advising and working with the Washington Ocean Acidification Center on the effects and sources of ocean acidification;
- Delivering recommendations to the Governor and Legislature on ocean acidification;
- Seeking public and private funding resources to support the MRAC's recommendations; and
- Assisting in conducting public education activities regarding ocean acidification.

What is ocean acidification?

Ocean acidification is a reduction in the pH of seawater for an extended period of time. Ocean acidity is primarily caused by the absorption of carbon from the atmosphere into oceans. Local sources of acidification from wastewater discharges and runoff from land-based activities may also contribute to ocean acidification.

The average acidity of the ocean's surface has increased about 30 percent since 1750.

The current rate of acidification is nearly ten times faster than any time in the past 50 million years, outpacing the ocean's capacity to restore oceanic pH and carbonate chemistry.

-Excerpt from the Panel's report



Throughout 2013 and 2014, the MRAC reviewed, evaluated, and prioritized the 42 actions from the Panel's recommendations. They broke free of organizational boundaries to ensure ocean acidification work is efficient, leveraged, and focused so that it becomes integrated into key programs across the state. Learn more about the MRAC and its work here: <http://www.ecy.wa.gov/water/marine/oceanacidification.html>.

A lot has been accomplished

Focus on ocean acidification and its threats has led federal, tribal, state, and local governments along with the shellfish industry, research institutions, and nongovernmental organizations to take action. Washington State is fortunate to have elected leaders, a shellfish industry, and scientists all coming together to face the threat of ocean acidification. The state is leading the way on how to handle ocean acidification. Our leadership has recognized the threat and funded \$1.85 million in ocean acidification work in the 2013-15 biennium. Our industry is standing up and willing to adapt, and state, private, nongovernmental, and federal scientists are all working together in this state to grasp the problem at hand.

In the 2013-2015 biennium, Washington State invested \$1.85 million towards ocean acidification research and coordination, and this investment has been used to leverage up to \$1.93 million in additional public and private funding.

We have a better understanding of ocean acidification and how it affects marine industries

Since the Panel released its recommendations, a major focus of ocean acidification research has been on developing a better understanding of where and how often ocean acidification conditions are most severe, who and what will be most affected, and how we might alleviate the most harmful consequences. In 2013, the state legislature funded a cutting edge research coordination center to focus on ocean acidification. The Washington Ocean Acidification Center (WOAC), housed at the University of Washington, has been working to answer the most pressing ocean acidification questions facing industries and decision-makers. Working closely with the shellfish industry, the WOAC has been able to assist the industry in gathering vital information on local ocean acidification conditions so hatchery operators can react in real-time to minimize the loss of oyster larvae. This real-time information is critical to the industries success in adapting to ocean acidification conditions.

WOAC has leveraged state funds to secure \$1.93 million in additional funding and developed partner relationships to increase coordination and efficacy of ocean acidification research. Across their work, WOAC has leveraged funds from the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation, Microsoft Research, and the shellfish industry. WOAC has also developed predictive tools and investigated how ocean acidification will impact other marine resource industries such as Dungeness crab. This work is critical as it guides Washington's industry, tribes, coastal communities, and resource managers in making sound management decisions to protect our marine ecosystems and the industries that rely on them.

The Department of Ecology and NOAA have also been working on ocean acidification research. The Department of Ecology received a grant from the Environmental Protection Agency to investigate how local sources contribute to ocean acidification. NOAA has contributed to the monitoring efforts and to our understanding of how corrosive conditions impact the marine food web and specific species of high economic value.

We are testing options to help shellfish growers adapt to ocean acidification

There are many ideas about how to reduce the harm caused by ocean acidification. Shellfish growers have already started implementing practices to adapt to corrosive conditions. It is likely that a collection of strategies will need to be used in Washington State to address ocean acidification and its impacts. Efforts are underway to investigate the efficacy and suitability of strategies for use in shellfish aquaculture and to protect other vital marine species.

We are investigating how local runoff adds to ocean acidification

Ocean acidification may be exacerbated by local runoff, especially in areas with high development and human use. Water quality programs exist focused on reducing runoff of nutrients into water bodies. The Department of Ecology is working to fully understand the impact of local nutrient contributions on acidification. The results of their work will inform whether more focused actions are needed to minimize impacts of local contributions to ocean acidification.

Key stakeholders are aware of ocean acidification

Through outreach and education efforts, Washington state resource managers, industry leaders, and key stakeholders are recognizing the importance of taking action against ocean acidification. In the past two years numerous public presentations and forums have raised the awareness of ocean acidification. The Suquamish Tribe has worked to develop an Ocean Acidification Curriculum Collection for K-12 educators to use in the classroom that includes curricula developed at the University of Washington. The State Department's 'Our Oceans Conference' nationally raised the importance of ocean acidification in our nation's waters with deep participation of our Washington shellfish growers who compellingly told their stories.

More needs to be done

Washington State leads on the issue of ocean acidification. Since the Panel released its strategy, progress on both investigating what we can do and taking actions to address ocean acidification have been significant. The current momentum and progress illustrate that Washington State is beginning to comprehend the risks faced by key marine industries, jobs, and local economies. By taking action to develop science and adopt best practices as quickly as possible, we can reduce this emerging threat to our economy.

What Washington needs to do

Over the next two years and beyond, a continued concerted effort is needed to coordinate and implement key on-the-ground ocean acidification actions. The MRAC will work to articulate funding needs and to identify opportunities to enhance work already underway. To do so, the MRAC has prioritized key actions and plans to support, coordinate, and advocate for their implementation. These actions include:



- Continue and expand monitoring efforts that directly contribute to marine industries taking action against ocean acidification conditions
- Provide ocean acidification forecasts to inform shellfish growers and resource manager actions
- Study how ocean acidification affects vital commercial and managed species such as salmon, rockfish, razor clams, geoduck, and fish
- Investigate the capacity of species to genetically adapt to ocean acidification
- Complete research on how local sources of nutrients exacerbate acidic conditions
- Investigate various strategies to adapt to and alleviate the impacts of ocean acidification, including:
 - Developing a seaweed cultivation program
 - Restoring native oyster populations
 - Supporting the creation of a shell recycling program
 - Establishing and managing refuges for species vulnerable to ocean acidification
- Continue to educate and raise awareness of ocean acidification to potentially impacted industries, stakeholders, and the general public
- Seek public and private funding to support these efforts including:
 - A 2015-17 biennium state funding request in the Governor’s budget of \$1.7 million for continued ocean acidification research and coordination
 - Working to identify federal funding opportunities that can be used in conjunction with state funding to improve monitoring and adaptation efforts.
- Track the results of this work through the Puget Sound Partnership

Washington is capable of responding to ocean acidification

As the Panel noted in their report: *Washington State will need to respond vigorously to ocean acidification if we are going to avoid significant and possibly irreversible losses to our marine environmental and all it supports, including shellfish farming and wild harvest of shellfish and other commercially and culturally important marine species.*

Washington has the expertise it needs to respond to ocean acidification. We have world-class scientists and organizations that can develop and define new innovative solutions. Our shellfish industry is committed to protecting native ecosystems and the resources they depend on for their livelihood. Continued coordination and attention on ocean acidification is critical to Washington’s ability to stay ahead of ocean acidification and show the county and world what a response to ocean acidification should be.