

# ADAPTING AND BUILDING RESILIENCE

Washington's rich natural resources are defining features of our communities, economy, culture and identity. Adapting to ocean acidification and building resilience are essential strategies for continued access to those resources, as well as for sustaining Washington's robust shellfish farming industry. Conserving and restoring nearshore habitats like kelp forests and eelgrass meadows builds resilience by reducing atmospheric carbon and improving local water conditions for marine species.

Industries that are dependent on the ocean, like shellfish farming and Dungeness crab fisheries, rely on ongoing efforts to monitor and improve ocean conditions so they can adapt business and harvest management practices for long-term sustainability.

## What We're Doing

A broad coalition of partners, including agencies, shellfish growers, Tribes, scientists and restoration organizations, are developing tools and information to strategically adapt to changing ocean conditions. This work aims to restore and enhance the resilience of Washington's shellfish and natural systems through collaborative solutions and collective action.

When the shellfish industry faced a coast-wide seed mortality crisis in 2007 due to ocean acidification, the shellfish industry responded by investing in increased monitoring and water treatment capacity. In the early days, shellfish hatcheries collected seawater samples in beer bottles to send to labs for analysis. Over time, carbonate chemistry monitoring in the hatchery improved so that data was collected in real-time, and hatcheries could respond to ocean acidification conditions by adjusting the depth and timing of seawater intakes. Today, hatcheries have more sophisticated treatment systems that adjust carbonate chemistry, so it is optimal for shell growth.

In the nearshore environment, eelgrass meadows and kelp forests may reduce effects of acidification through photosynthesis.

Research has shown that Pacific oysters grow more rapidly in or near eelgrass meadows. In 2022, the Washington State Legislature directed WA DNR to develop a [Statewide Kelp Forest and Eelgrass Meadow Health and Conservation Plan](#), with a goal of conserving and restoring at least 10,000 acres of these critical nearshore habitats by 2040. In addition, the Washington State Legislature funded actions by 11 partners to implement priorities of the [Puget Sound Kelp Conservation and Recovery Plan](#), between 2021 and 2025.

## Why This is Important

Through ongoing monitoring efforts, we see that more acidic conditions are present in marine waters for more days in the year, which is impacting ecologically and culturally important species like oysters and crab. If atmospheric carbon continues to increase, water conditions that support healthy shellfish beds and other calcium-dependent species will become more limited. Deteriorating ocean conditions are expected to lead to population crashes and fisheries closures that directly impact human communities and economies. Additionally, shellfish farmers are being forced to contend with warmer waters and more acidic conditions as carbon dioxide warms the planet and absorbs into the ocean.



## Managing Washington's Marine Resources

Shellfish grower actions to adapt practices and maintain production amid changing ocean conditions include:

- New wet storage, recirculating system to reduce bacterial outbreaks resulting in part from increasing sea water temperatures.
- Research and monitoring to recover seed production and predict changing chemistry and temperatures.
- Puget Sound Restoration Fund grants to develop systems for harvesting and using macroalgae growing on crops and gear, and to research benefits of growing kelp adjacent to shellfish.
- Research demonstrating the potential refuge capacity of seagrass beds.
- Projects demonstrating the productivity benefits of growing shellfish within eelgrass meadows.

Broader marine resilience-building actions include:

- Experimental kelp and eelgrass restoration is helping us better understand the conditions needed for success.
- Larger scale native oyster restoration projects in priority bays and inlets
- Establishment of a conservation hatchery called the [Chew Center](#), which produces seed for restoration actions

Growing engagement/education actions include:

- Citizen and community climate science initiatives, youth climate leadership, and climate science curricula

## What Still Needs to Happen

**Key priorities include:**

- Expand knowledge of local and regional patterns of vulnerability and resilience to more acidic conditions. Link data points to real-world observations and natural resource management.
- Conserve and restore marine vegetated habitats, such as kelp forests and eelgrass meadows, to reduce the negative impacts of changing ocean conditions and build marine resilience.
- Continue research by shellfish growers and scientists in breeding oysters that can tolerate changing ocean conditions.
- Co-culture seaweed among shellfish crops, and potentially increase reliance on bays and other areas with extensive eelgrass meadows that may serve as a refuge for shellfish.
- Expand models of refuge areas to include multiple species, climate stressors, and human well-being impacts, to support cultural and economic resilience.



This work supports Washington's strategy to invest in Washington's ability to adapt and remediate the impacts of ocean acidification.

Visit [www.oainwa.org](http://www.oainwa.org) to learn more about Washington's strategic response and the Marine Resources Advisory Council

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